Gas Journal

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Editorial Notes

Future Developments

" And the new sun rose, bringing the new year "—words as our readers will remember were penned by the poet to describe the morning after that night of tragedy when Arthur the King had been borne by the three Queens out of sight across the waters. " The old order changeth, yielding place to new." Peculiarly appropriate though these words are at the commencement of the year 1937, it is not with their political or historical significance that we are here concerned, but with what that new sun may bring to the Gas Industry. The new year is traditionally a time of mental stock-taking, and there is just now probably no better way than by giving some brief consideration to new ideas set forth at the Autumn Research Meeting of The Institution of Gas Engineers, and in other places.

Perhaps the most significant change that has come into our mentality of late has been the realization that present methods of gas manufacture have attained so high a pitch of excellence that it is unnecessary to engage in research upon known processes of manufacture. This leaves our research chemists free to examine processes and ideas that have not yet been accepted, and to pave the way for new methods—always the most important, though (in a financial sense) the most speculative field for research. The President of the Institution, in the last session of the Autumn Meeting said that he was as much afraid of Research with a capital R as of Art with a capital A. We take leave to disagree in part; the two are not parallel. Nevertheless, it is true to say that the Art (again with a capital A) of one generation is often the common-place of the art (with a small a) of the next. The history of painting, for example, reveals that some who are now considered to be Old Masters were in their day regarded as iconoclasts and over-bold innovators. If, by pursuing Research with a capital R, we could find even one bold innovator who would enable a fundamental improvement to be made, who would say that the few thousands expended on the work would have been wasted? There was never a more classic example of apparently unpractical Research (with a capital R) than the work of Faraday and Maxwell; but the whole world knows the outcome, and none better than the Gas Industry to whom it raised its greatest competitor. The fact remains that the 21 Research Associations founded under the ægis of the Department of Scientific and Industrial Research are proving wholly satisfactory, and on all sides comes news of the business men in the industries concerned increasing their financial allocation to permit of extension of the work. The plain fact is, too, that it is impossible to foresee whither any piece of work will lead; the most erudite work in pure mathematics, physics, or chemistry may, *properly interpreted*, give rise to technical progress of the highest importance. That is why those who have studied closely the history of industrial development welcome research, even if it be spelt with a capital R.

There is, however, the very practical objection that we have problems enough to encounter without hazarding our monetary resources on notoriously speculative long-range research. The question was raised at the Institution Meeting as to whether we spend enough on research. Should we be better with a Research Association in which part of the funds were raised within the Industry and part subscribed by the D.I.S.R.? That is the problem which the British Gas Federation through its constituent bodies might very well consider. It should not be impossible to increase our research work enormously, if it were found desirable so to do, by arranging for a levy from every gas undertaking. A levy amounting to 1d. on each ton of coal purchased would bring in an income of some £75,000 annually. Can it be said that that is too high a price to pay for insurance against the future? Unquestionably our competitors are engaging in an ever-increasing volume of research. The only way to counter that is by keeping in front of them by making advances on our own account. Research is countered only by research, and wherever we turn, to whatever industry we look, this is true under our present industrial conditions.

It will be noticed, however, that the words " properly interpreted " have been italicized. The reason is that

research is not a mechanical device into which one puts a penny and certain other ingredients, turns a handle, and out comes just the toy we were looking for. Research is a method of measuring, investigating, and ascertaining the processes of Nature when submitted to certain artificial conditions. That part of the work is mechanical; that is the part in which, having put in our penny and turned our handle, certain things are ejected for our inspection. The real value of research depends upon how we treat what has been obtained. In other words, the value of research depends on the brains used in interpreting the results. Without disrespect to anyone, there are very few men in any industry at any one time who are able to make the best of research. Only a genius can do that. Research work depends for its value on the genius of those who direct it, and it is, therefore, personal and individualistic. We cannot do better than leave readers to ponder over some words that were written almost exactly three years ago by Mr. J. H. West relating to the establishment of research departments: "It is sheer waste of money for manufacturers to set up elaborate research departments unless they can find the right men to direct them. It is not so much the lack of men capable of doing research as of men capable of initiating it and directing it into the right channels. Such a man, besides possessing the very highest scientific attainments, must be intensely industrially-minded, have the vision to think five or ten years ahead, a comprehensive grasp of economic trends and possibilities, and be a born leader of men with personality and driving power so that he can impart to his staff his own enthusiasm and determination to overcome difficulties and to get results. Such men are very rare." Such men are not only rare, they are sometimes passed over as theorists by those whom they would serve. Was it not into the mouth of the most famous of the Roman Emperors that Shakespeare put the words:

"Yond' Cassius has a lean and hungry look,
He thinks too much: such men are dangerous."

Objects of Future Research

At the present time the Gas Industry depends for its economics upon its secondary activities as a fuel industry and a chemical industry. The value of the by-products, among which coke is classed though it is rapidly becoming a major product, in enabling gas to be sold at an economic price, is indeed great. It is difficult to visualize the Industry without by-products; yet according to present indications we may one day have to do so. This is uncertain. There have been many fundamental changes in the habits of people within the lifetime of even the middle-aged. Home life has given place to travelling and to café life. Entertainment is available and patronized to an extent never imagined by the Victorians. The household has ceased to build on monarchistic lines, and is now a democracy, if not a Republic. With this has come a dislike on the part of many women in this country, particularly in the South of England—but, of course, widespread throughout the world—to do the same amount of housework that was formerly considered their duty. This has led the Gas Industry to believe that solid fuel, with its inevitable dirt and the need for cleaning the fireplaces, laying and lighting the fire, will be displaced by gaseous fuel. Perhaps it will be so. If so, it will be the task of the Gas Industry to devise means for the total gasification of coal, so that it will not be necessary to dispose of coke. That research has already been commenced, and the possibility inherent in this view is before the Industry. But let it not be forgotten that the necessity for total gasification with production of gas of present calorific value is only part of the story. If we are to sell gas alone, it is necessary that our gas must be sufficiently low in price to displace solid fuel completely. The discussions at the Institution Meeting in June showed that this object is in the minds of many engineers who are endeavouring to formulate tariffs that will admit of all-gas houses even in the poorer quarters. Let it be remembered that this, too, must be one of the prime objects of research, and that we cannot and must not be satisfied with methods of total gasification which enable gas into holder to be produced at approximately the same price as coal gas to-day.

Again, there is a growing tendency to use central heating. At present our own feeling, based on practical experience, is that it is difficult from the point of view of comfort and price to better a domestic system of hot water radiators with gas fires in each room used for evening r afternoons and with gas cooker and gas refrigerator. It is not even certain that people will not prefer central heating, either by gas or solid fuel, ultimately; what guarantee is there that the popular taste will not change? In Paris there has been since 1930 in use a system of heating buildings by a central steam-generating utility. By concentrating the production of heat in the modern plants of steam utilities, this system permits of saving of about one-third of the quantity of coal required otherwise for heating a building, and a freedom from the requirements imposed by city ordinances regarding the quality of coal used in heating buildings. Special coal reserves become unnecessary, and the total production of the coal mines of the country may be used for domestic heating purposes. The existence of the utility, because of the installation of its pipelines, promotes the generalization of central heating of buildings in the neighbouring zone of its mains as well as of its continuous domestic hot-water service. The Parisian lay-out has reached, in the five years since its inception, a length of 10 kilometres; the pipes extend half-way across the city and distribute 125,000 tons of steam, corresponding to a yearly coal consumption of 35,000 tons, or about 2% of the total coal consumption of the city. According to present plans, the system is to be doubled within the next two years. With such systems available and obviously popular, the need for cheap domestic gas becomes paramount.

Use of Non-Coking Coals

Stress was laid by one speaker in the Institution discussion on research upon the need for using non-coking coals for gas-making purposes. This seems at first sight to be little less than an absurdity, as it would constitute a complete departure from all existing methods of gas-making, save those practised by the South Staffordshire Mond Gas Undertaking. It is well, however, to recognize what is behind this plea. At the outset, let us remember that the Lurgi process for complete gasification with production of gas of high calorific value now being investigated by the Institution chemists has only been applied to lignites and geologically immature fuels. There is expected to be considerable difficulty in applying it to coals. It seems to be essential to use a highly reactive coal for the purpose. The non-coking coals of Leicestershire and Warwickshire, to mention no others, are of this character, so

the way may soon be open for the exclusive use of non-coking coals. What seems a fantastic idea is thus already in process of being translated into practice.

It is well to consider the basis for the demand for the use of non-coking coal in gas-works. This demand, in a different form, has been widely heard during the last two years, more particularly from the iron and steel industry. It has been pointed out that the quantity of first-class coking coal in this country is severely limited, and that such coal should be reserved for the iron and steel industry, which must have coke of the highest quality if its processes are to be carried on with that efficiency and low fuel cost which national economy demands. The prosperity of the iron and steel industry is closely allied to the prosperity of the nation as a whole, and therefore to that of the Gas Industry. Consequently the Gas Industry cannot turn a deaf ear to representations of this character.

It has been computed on high authority that the amount of coal known to exist in this country which will be available at the surface after mining is 170,000 million tons. Of this, it is stated that some 70% is non-coking. It is probably correct to say that not more than 10% would represent coals which coke sufficiently well to produce high-grade furnace coke. The quantity of coking coals used by the coke oven and gas industries is broadly some 40,000,000 tons a year. Under present conditions, therefore, we have some 17,000 million tons of high-grade coking coals which are being used up by carbonization at the rate of 40,000,000 tons a year. Actually, this rate is greater, for some unknown amount of this coal is used for the domestic grate and for industrial purposes. It may be assumed that some 60,000,000 tons represents the total usage of coking coal annually—so that we have about 280 years' supply of first-grade coking coals. Probably the position is worse than this at the moment, but research is bringing coals of a somewhat lower coking power within the furnace coke category. It may be considered that, as a fair average in years of good trade, 14,000,000 tons of coal a year is carbonized annually to produce furnace coke; for the rest, poor coking coals and non-coking coals could be even better used—since they yield inherently a far more combustible coke than do the coking coals—if a method could be found for using them. We should then have a potential life of 1,200 years for our best coking coals. These figures may be considerably in error in various directions, due to the fact that we have as yet insufficient knowledge of our coal resources, but they are of the right order of magnitude and serve to indicate the need for research into the use of non-coking coals on the lines suggested at the Institution Meeting. They also serve to indicate the *raison d'être* for two of the three questions propounded by Mr. E. C. Evans at the Coke Symposium in Manchester:—"Are the reserves of coking coals available in Great Britain sufficient to meet the potential demands of iron and steel producers over an extended period? Is it possible to extend the range of coking coals so as to allow of the use, for (furnace) coke manufacture, of (*a*) coals which do not, with present methods of carbonizing, produce a coke of quality sufficiently good for blast furnace operation; (*b*) coals which are otherwise of high coking quality, but which contain too high a percentage of sulphur to be capable of utilization?"

The position is probably more serious than we have here indicated, for it is undoubtedly causing considerable uneasiness to the iron and steel manufacturers.

Motor Spirit

Using the term "motor spirit" in its widest implication it may be taken to include benzole in all its forms, and any other motive power for driving the internal combustion engine. The President of the Institute of Fuel, himself a Member of Parliament, hinted in his Presidential Address that the recovery of benzole from gas-works was not considered satisfactory. There are no definite statistics available for indicating the quantity of benzole produced in gas-works. No returns are made of crude spirit, and the returns of purified spirit from tar works may include both coke oven and gas-works spirit in some unknown proportion. The Mines Report states that benzole was extracted from 44% of the coal used in gas-works in 1935, but that the recovery of crude benzole was only 2·16 gallons per ton, as compared with 3·03 gallons from coke ovens. The complete recovery of benzole at gas-works is closely bound up with the declared calorific value of the gas; it was suggested at the Institution Meeting that an extended survey should be made upon the whole subject of the optimum declared calorific value of gas and benzole recovery.

It appears, in the present state of politics, to be a national duty to recover as much benzole from gas as we possibly can, and signs are not wanting that pressure may be put upon the Industry to do so. We doubt whether anyone would argue in favour of 200 B.Th.U. gas for general use, even though the Mond Gas Company, according to the recent Institute of Fuel discussion, seemed to be quite pleased with their 160 B.Th.U. gas for industrial purposes. Nevertheless, a combined technical and economic enquiry throughout the Industry conducted by a whole-time investigator thoroughly competent to investigate gas distribution as well as manufacture, might reveal positive advantages in going to some figure between 450 and 400 B.Th.U. which would permit benzole to be completely extracted and an additional proportion of blue water gas to be made by water gas plant, by steaming verticals, or by steaming horizontals in accordance with the latest Fuel Research Board procedure that is now being applied in several large works. It might be that when this question was submitted to detailed and expert enquiry some fundamental conclusion would arise of the highest importance to the Industry; an enquiry of this character demands no laboratory investigation, but is no less suitable on that account as a subject for research. Individual gas managers are not necessarily best fitted to judge the merits of such a proposal from the point of view of local conditions, for preconceived ideas must interfere with judgment, albeit unconsciously.

The production of benzole containing paraffins is another subject that might be investigated. The value of motor benzole would be similar to that of petrol were it not for the aromatic content of benzole which gives it valuable anti-knock properties. It is widely considered that the value of benzole should depend upon its content of aromatic hydrocarbons and that the paraffin content should only be paid for at paraffin prices. It seems probable that some such scheme of pricing will be introduced before long. Coke ovens have shown the way to modifying the composition of benzole by passing the gases evolved from the coal through a heated channel above the oven chamber in which the heat is not high enough to cause loss of benzole, but is yet high enough to cause sufficient decomposition to reduce the content of paraffins and of higher-boiling

constituents, thereby incidentally increasing the yield of light spirit. Can any such device be usefully incorporated in vertical retorts?

Coke Oven Gas in Scotland

THE Reports have been published by H.M. Stationery Office of the Departmental Committee on Gas Supplies in the West of Scotland. This Committee, consisting of Sir Alexander Walker (Chairman) and Messrs. T. H. Thorneycroft, R. Bryce Walker, J. Jamieson, P. J. Dollan, and G. Evetts, was, on the recommendation of Sir Arthur Rose, Commissioner for the Special Areas in Scotland, appointed by the President of the Board of Trade in October, 1935, to consider the possibility of co-ordinating the manufacture and distribution of gas in the West of Scotland. A majority report is signed by all the members with the exception of Mr. Dollan, Treasurer of the Glasgow Corporation, who has submitted a minority report in regard to the methods by which the coke oven gas available should be utilized. It is pointed out by the Committee that the prosperity of the West of Scotland is largely dependent on the basic industry of iron and steel, and the only way in which Scotland can hold her own in the pig iron market is by complete modernization of the coke ovens and iron works; and since this depends largely, if not entirely, on a market being found for the coke oven gas, the Committee feels that in the national, as well as in their own, interest gas undertakings adjacent to the coke ovens should seriously consider the taking of supplies. At the same time, consumers of fuel for industrial purposes should carefully investigate their processes and heat requirements to see whether advantages will not accrue to them by taking supplies of gas at prices which have not hitherto been available for town gas.

In this connection the Committee points to the progress which has been made in Sheffield as a result of the gas grid scheme, and freely acknowledges the help received in the present enquiry from the evidence of Mr. Ralph Halkett. In view of the success of the Sheffield scheme, it is asked why the Glasgow Corporation should withhold its assistance in the industrial development of the West of Scotland by refusing to take more coke oven gas. It was, of course, this point which caused such concern to Sir Arthur Rose. Mr. Halkett, having formerly occupied the position of Assistant General Manager to the Glasgow Gas Department, has a wide experience of the Glasgow area, and, in evidence during the enquiry, he expressed the opinion that by working with 50% coke oven gas the commodity price in Glasgow would be reduced all round. On the question of price, he expressed the view that a reasonable price to pay for coke oven gas in order to distribute it for industrial purposes in Glasgow would be 5½d. per 1,000 cu.ft. at the coke ovens crude and compressed.

The coke ovens with which the Committee was concerned were those owned by James Nimmo & Co., Ltd., at Auchengeich, from which Glasgow has for some time taken 2 million cu.ft. of gas a day, those recently completed by William Dixon, Ltd., at Govan, and those which William Baird & Co., Ltd., propose to erect at Coatbridge if satisfactory arrangements can be made for the coke oven gas to be absorbed. In regard to James Nimmo, Ltd., the Glasgow Corporation has given notice to terminate their agreement with the Company this month. During the enquiry the Company drew the attention of the Committee to the fact that under this agreement, which was entered into in 1925, the price paid for coke oven gas (11d. per 1,000 cu.ft.) was related to the cost of production at the Glasgow Gas-Works, and suggested that such a price basis is a reasonable one. The Committee—and this is important—does not accept the view that a gas undertaking should necessarily be prepared to pay a price which would enable it to put coke oven gas into its holder at a price just below its own costs of production. There is the cost borne by gas undertakings in maintaining stand-by plant and meeting peak loads, and allowance should be made for the advantages which an undertaking controlling its own production possesses compared with one dependent on outside supplies.

The Gas Grid

THE Committee's enquiry was confined to the industrial areas of Lanarkshire and Renfrewshire, of which Glasgow is the centre, and the question of a gas grid in the area was considered. In regard to the undertakings in Renfrewshire, and of Hamilton, Motherwell and Wishaw, and Lanarkshire County Council, the Committee is satisfied, in view of the size of the undertakings, their distance from the coke ovens, and the small potential demands for bulk supplies of gas, that it would not be an economical proposition at the present time to lay mains for the transmission of coke oven gas to those undertakings. At the same time, the possibility of conveying supplies of coke oven gas, whether from existing coke ovens or from others that may be erected in future, should be reviewed from time to time by the undertakings concerned; and the Committee states that the position would be met if no loans for replacement or extension of carbonizing plant are sanctioned for gas undertakings in the area until the undertaking concerned has satisfied the competent Department that the economic possibility of taking supplies of coke oven gas has been explored. The conclusion has been reached, however, that co-ordination is both essential and practicable between the Glasgow Gas Undertaking and the coke oven plants of Messrs. Nimmo, Dixon, and Baird, and between the Coatbridge and the Airdrie Gas Undertakings and the coke oven plant of Messrs. Baird. The Committee recommends that the Glasgow Corporation should enter into negotiations with the coke oven owners for the purchase of the total quantity of gas available or in prospect (18¼ million cu.ft. a day) less the quantities to be purchased by the Coatbridge Company and Airdrie Town Council; and that the Airdrie Town Council should enter into an agreement with the Coatbridge Gas Company to purchase all their requirements of gas by means of a bulk supply of coke oven gas obtained by the Company from Messrs. Baird. In submitting these recommendations, the Committee maintains that, with goodwill and co-operation between all the parties concerned, it will be possible for them to negotiate a series of agreements to their mutual satisfaction, which will have beneficial results on the industrial situation in their area and on the prices of gas charged to consumers. Should the expectations not be realized then " the Government should take such action as they may consider necessary, including, if need be, the introduction of legislation to ensure that the coke oven gas is made available for public use."

Among other matters discussed in this comprehensive Report is the question of period of contracts, and in

this connection a minimum of ten years is recommended. Then, in regard to coal stocks, the Committee recommends that stocks sufficient for the production of four weeks' supplies of the quantity of gas being supplied at any time should be maintained by the coke oven owners. The problem of coke sales is also considered, and here it is clear that co-operation between the two coke-producing industries for the regulation of sales of coke is essential. Such co-operation could be secured by the setting-up of a joint committee, and the Report recommends that the two industries should take steps to establish such a committee, which should be a permanent body. A further recommendation is the establishment in the West of Scotland, with headquarters at Glasgow, of an Industrial Gas Centre, and that each of the gas undertakings in the large towns in the area should strengthen their sales organization to obtain the maximum results from the central organization.

Question of C.V.

In the foregoing we have set out the main findings of the Committee. One section of the Report, an exceedingly interesting one from the technical aspect, is the question of the calorific value at which the coke oven gas shall be supplied. This section indicates how necessary it is that we should be able to express gas quality in relation to its proper utilization. Glasgow supplies gas of 470 B.Th.U., Coatbridge 500 B.Th.U., and Airdrie 425 B.Th.U. The Coatbridge Gas Company during the enquiry explained that in recent years they had experimented with gas of 450, 475, and 500 B.Th.U., and that they are definitely of the opinion that from the point of view of both the supplier and the consumer the 500 B.Th.U. quality is the most suitable. Their arguments in favour are set out in the Report, and it is mentioned that the Airdrie Town Council have expressed their willingness to take gas of 500 B.Th.U. On the other hand, representatives of the Glasgow Corporation explained that as a result of their experience they were absolutely satisfied that, taking all factors into consideration, the adoption of 470 B.Th.U. was the sounder economic proposition. Since Glasgow supplies more than 95% of the total quantity of gas at present sold by the three undertakings, the Committee has recommended that the coke oven gas should be of such a quality as to enable the declaration of a calorific value of 470 B.Th.U. to be made.

At the beginning of our reference to the Committee's findings we mentioned the minority report of Mr. Dollan, who differs from his colleagues on the Committee regarding the methods by which the coke oven gas should be utilized. What he would like is the establishment of a gas grid for Glasgow and the West of Scotland, under public ownership and management, which would "control the production and distribution of gas for the public benefit, similar to the control of the production and distribution of electricity now exercised by the Central Electricity Board and its subordinate concerns." His proposals may be summarized thus: Parliament should legislate to set up a gas grid owned and managed by the State and the local authorities, that this grid should have power to close redundant plants and "utilize all gas products for the social and industrial needs of the community," that capital expenditure for developments should be provided by the State or by State guaranteed public issues, plus contributions from the iron and steel industries in return for a guaranteed market, and that the operation of the grid should be conducted in such a way "as to give domestic consumers as well as industrial consumers the advantage of low prices."

1937 CALENDAR AND DIRECTORY

We desire to express our regret that this year, for the first time, there has been delay in the delivery of the Calendar and Directory to the greater number of our readers. This was caused primarily by the chaotic conditions of the mails throughout the country—one important batch of final press proofs took four days between Bolt Court and Edinburgh. Such was the delay that the Scottish New Year Holiday supervened when only the first parcel of special copies had been dispatched.

Our desire is foremost that the information we present shall be right up to the minute; and the following list of recent changes, together with some corrections, should be marked in the Directory. Subsequently, the first number of the "JOURNAL" in each month will contain supplementary information, arranged as heretofore under the distinctive heading at the beginning of the "News."

Page 10. BRIGHOUSE. For J. Carrigan read J. Corrigan.

Page 16. CHESHAM. Should be starred as a subsidiary of Associated Gas and Water Undertakings, Ltd.

Page 16. CHEPSTOW. Acquisition by Severn Valley Corporation, Ltd., completed.

Page 24. FARNHAM. Acquisition completed.

Page 28. GUILDFORD. Acquisition completed.

Page 36. KILDWICK. No substantial change.

Page 64. STRETFORD. J. Carr appointed E., G.M., and Cl., vice W. M. Carr, resigned.

Page 66. TAMWORTH. L. N. Burtonshaw appointed E. & G.M.

Page 68. TUDHOE. Delete R. G. Flemming; sales, 12 millions.

Page 70. UPPINGHAM. Acquisition by Gas Consolidation, Ltd., completed.

Page 76. WINSLOW. Should be starred as a subsidiary of the United Kingdom Gas Corporation, Ltd.

Page 78. YORK. Acquisition by United Kingdom Gas Corporation, Ltd., completed.

Page 90. NAIRN. No substantial change.

Page 90. PITLOCHRY. J. Young, E. & M., vice A. M'Alpine.

Page 92. STEWARTON. P. B. Pretcell appointed E. & M.

Page 94. BALLINA. T. J. Reid, deceased.

Page 96. MAGHERAFELT. T. Broderick, M., vice P. Drohan.

Page 121. ASSOCIATED GAS AND WATER UNDERTAKINGS, LTD. An Extraordinary General Meeting on Jan. 1 authorized the creation of 750,000 ordinary and 750,000 irredeemable cumulative preference shares of £1 each. Capital now £2,500,000.

Page 131. HEIDELBERG. A. A. Macintosh is Manager.

Page 148. B.C.G.A. P. J. Lucas appointed General Secretary.

Chemical Engineering Congress, 1936

Mr. M. W. Burt, General Secretary, has forwarded the following condensed statement of income and expenditure in connection with the Chemical Engineering Congress of the World Power Conference, held at the Central Hall, Westminster, June 22 to 27, 1936:

Income.

	£	s.	d.
Donations	5,093	9	4
Membership fees and sale of papers	1,252	6	1
	£6,345	15	5

Expenditure.

	£	s.	d.
Editing and printing of papers and transactions	2,897	19	4
Banquet, reception, visits	495	18	1
General expenses	2,951	18	0
	£6,345	15	5

Personal

Representative of National Associations in Scotland.

Mr. WILLIAM R. DRUMMOND, M.A., B.Sc., C.A., has been appointed by a Joint Committee of representatives in Scotland of the National Bodies as their resident officer in Scotland. This appointment has been approved by the Central Executive Board of the National Gas Council and by the Executive Committee of the British Commercial Gas Association.

After spending a short time at Gas Industry House in London making himself acquainted with the work of the various organizations, Mr. Drummond has now taken up his duties at the temporary office, 242, West George Street, Glasgow, where all communications should be addressed to him. He will from now undertake all secretarial duties relating to the National Gas Council, Federation of Gas Employers, and the British Commercial Gas Association in Scotland.

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We learn that Col. W. M. CARR, O.B.E., T.D., Engineer, General Manager, and Clerk to the Stretford and District Gas Board, resigned on Dec. 31 in order that he might devote himself entirely to his duties as Managing Director of the United Kingdom Gas Corporation, Ltd.

Col. Carr has also terminated his private practice as Consulting Gas and Water Engineer. He will, however, retain the outside position as Consulting Engineer to the Stretford and District Gas Board.

His position at Stretford has been filled by the appointment of Mr. JAMES CARR, M.C., who has been the Assistant Engineer and Manager for the past twelve years.

* * *

The Directors of Messrs. William Sugg & Co., Ltd., announce the resignations of two of their Directors—namely, Mr. H. J. WALLER and Mr. J. W. LOFTS.

Mr. Waller has been associated with the Company for upwards of fifty-seven years, during which period he occupied the positions of Chief Accountant and Secretary, the latter office being held by him for thirteen years. In 1920 he was appointed Director of the Company, relinquishing his position as Secretary in 1923, but continuing to act as Director and Chief Accountant. Mr. J. W. Lofts entered the service of the Company in 1880 and had his early training in the Works under the late William Sugg. He was appointed Sales Manager in 1911 and Director in 1920, still retaining the control of the Sales Department. The Directors pay the very highest tribute to these colleagues, who have, during so many years of devoted service and loyalty to the Company, merited their whole-hearted approbation.

In order to fill the vacancies on the Board created by these resignations, the Directors have appointed Mr. PHILIP CRAWFORD SUGG, B.Sc.Eng.(London), A.C.G.I., a grandson of the late William Sugg (Founder of the Firm) and son of Mr. Philip H. Sugg (Chairman and Joint Managing Director), and Mr. WILLIAM THOMAS MATTOCK, who has been associated with the Firm for many years, and is the son of Mr. W. Mattock (Joint Managing Director).

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At the annual dinner of the Chesterfield Gas Department (reference to which is made elsewhere in this issue) Mr. R. C. GREEN, Sales Manager, was the recipient of an oak bookcase to mark his resignation from the Department to take up an appointment with a Chesterfield firm.

Mr. Green began his association with the Gas Industry in 1918, when he was appointed Manager's Assistant for the Biggleswade Gas Company. He then became Chief Salesman for the Gosport Gas Company, and before going to Chesterfield was Sales Manager for the Bridlington Gas Company. He has held his position under the Chesterfield Corporation for three-and-a-half years.

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We understand that, while retaining his position of Manager and Secretary of the Rugeley Gas Company, Mr. L. N. BURTONSHAW has been appointed Engineer and General Manager of the Tamworth Gaslight and Coke Company. Both Undertakings are controlled by Gas Consolidation, Ltd.

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Mr. P. B. PRETCELL, formerly of Kelty Gas-Works, has been appointed Engineer and Manager of the Stewarton Gas Light Company, near Kilmarnock. On leaving to take up his new appointment Mr. Pretcell was the recipient of a clock from his colleagues and friends at Kelty.

Obituary

With deep sorrow we announce that Mrs. R. J. MEIKLEJOHN, of Craig Side, Rugby, died on Monday night, from pneumonia after influenza. The sympathy of all their many friends is extended to those whom she has left bereaved. The funeral will be at 12 noon on Friday at Holy Trinity Church, Rugby.

Forthcoming Engagements

Jan.

9.—SCOTTISH EASTERN JUNIORS.—Visit to Alder & Mackay, Ltd., Edinburgh.

9.—SCOTTISH WESTERN JUNIORS.—Paper by W. Gledhill, of Stirling, "Development of a Gas-Works Amalgamation."

11.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

11.—WOMEN'S GAS COUNCIL.—Executive Committee Meeting, 2.30 p.m., at 1, Grosvenor Place, S.W. 1.

12.—NATIONAL JOINT INDUSTRIAL COUNCIL FOR THE GAS INDUSTRY.—Meeting at Gas Industry House, 12 noon.

12.—N.G.C.—Central Executive Board Meeting, 2.30 p.m.

12.—I.G.E.—Council, 10 a.m.

13.—I.G.E.—Board of Examiners, 2.30 p.m.

14.—I.G.E.—Public Lighting Sub-Committee, 2.30 p.m.

14.—MIDLAND JUNIORS.—Paper by G. E. Stevenson, of Long Eaton, "Obtaining the Goodwill of the Consumer."

15.—I.G.E.—Joint Committee on Complete Gasification under Pressure (16, Old Queen Street, S.W. 1), 3 p.m.

16.—YORKSHIRE JUNIORS.—Meeting at Sheffield. Paper by A. E. Wilson, "My Last Twelve Months with Industrial Gas."

18.—WOMEN'S GAS COUNCIL.—Inaugural Meeting of the London and Home Counties Demonstrators' Circle, 7.30 p.m.

19.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Committee, 2.30 p.m.

20.—B.C.G.A.—District Meeting at Cardiff.

21.—B.C.G.A.—District Meeting at Birmingham.

21.—SOUTHERN ASSOCIATION (EASTERN DISTRICT).—Meeting at Gas Industry House, 2.30 p.m. Discussion on "Unaccounted-for Gas."

21.—S.B.G.I.—Council Meeting, 2.30 p.m.

22.—LONDON AND SOUTHERN JUNIORS.—Paper by T. J. Legge and T. G. Noble, "Baffler Performance in Relation to the Safety of Gas Appliances."

23.—MIDLAND JUNIORS.—Visit to Walsall Gas-Works.

23.—SCOTTISH WESTERN JUNIORS.—Visit to Port Glasgow Gas-Works.

23.—WESTERN JUNIORS.—Visit to Works of Swindon United Gas Company. Paper by D. A. Vince, of Swindon.

23.—WALES AND MON. JUNIORS.—Meeting at Neath. Paper by D. Rees, of Neath, "Reconstruction of an 1877 Gasholder."

27.—B.C.G.A.—Annual Meeting of Members in Scotland, Edinburgh.

28.—B.C.G.A.—District Meeting at Newcastle-upon-Tyne.

29.—B.C.G.A.—District Meeting at Exeter.

29.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.

Feb.

3.—MANCHESTER AND DISTRICT JUNIORS.—Visit to West's Gas Improvement Co., Ltd.; Paper by J. Holland, "Works Reconstruction with Economies."

3.—LONDON AND SOUTHERN JUNIORS.—Visit to Davis Gas Stove Company, Ltd., and Electrolux, Ltd., Luton.

4.—MIDLAND JUNIORS.—Paper by W. N. Smirles, "Gas-Heated Hot Water Systems."

6.—SCOTTISH WESTERN JUNIORS.—Annual Whist Drive and Dance.

6.—SCOTTISH EASTERN JUNIORS.—Visit to Dundee Gas-Works; Paper by D. Warden.

12.—LONDON AND SOUTHERN JUNIORS.—Paper by F. O. Hawes, "The Effects of Changes in Composition upon the Combustion of Town Gas."

13.—SCOTTISH WESTERN JUNIORS.—Debate Meeting.

18.—JUNIOR ASSOCIATIONS.—Visit to B.I.F., Birmingham.

News in Brief

CURRENT EVENTS IN THE GAS INDUSTRY

The Ideal Home Exhibition will be held at Olympia, London, W. 1, from March 30 to April 24, 1937.

Through the Kindness of the Tranent Gas Company, many of the children in the town were made the recipients of seasonable gifts last week.

A Scheme for the provision of additional showroom and demonstration facilities has been approved by the Keighley Corporation Gas Committee.

As a Contribution to the Coronation celebrations the Accrington Gas Board have been asked if they will arrange for the floodlighting of the Cenotaph in Oak Hill Park, Accrington, and their own offices.

All Towns and Villages using electricity from the Rossshire Supply Company were thrown into darkness on Jan. 2, the stoppage lasting for four and a half hours over a wide area. The dislocation was caused by the fall of a tree.

For Public Lighting the Ferryhill Parish Council, Durham, considered quotations from the North-Eastern Electric Supply Company and the Spennymoor Gas Company. It has been decided to accept the tender of the Gas Company.

The Acquisition of the Winchester gas undertaking by the Southampton Gaslight and Coke Company, authorized by Special Order, took effect, we learn, as from Jan. 1. The total capital of the amalgamated concerns approximates £1,500,000.

His Royal Highness the Duke of Kent has consented to be the principal guest and speaker at the banquet to be given by the Government at the Mansion House, by the courtesy of the Lord Mayor, on Feb. 15, to mark the opening of the British Industries Fair.

A **"Black-Out"** occurred in Stonehaven on Dec. 29 when the electricity supply failed for half-an-hour. The breakdown, which occurred at six o'clock in the evening, affected the street lighting as well as that in many shops and private houses which had not the advantage of gas lighting.

A Tribute to the usefulness of gasholder direction signs for aircraft was paid to Dewsbury Gas Department, through the local Press of that town last week, when a Leeds airman expressed appreciation of the directions on a Dewsbury holder, which put him on his course after he had lost his bearings above the clouds.

The Excellent Progress of the Chesterfield Gas Department was referred to by Mr. H. Davies, Engineer and Manager, at the annual dinner of the Department on Dec. 30. Seventeen years ago the annual output was 220 million cu.ft., but last year it would be 600 million cu.ft. A report of the function will be found in other columns of this issue.

A Record Number of Appliances were fixed by the Salford Gas Department during the past year. The first sections of the reconstruction scheme at the Works have been completed, and the enlarged vertical retort house is now at work. Benzole production now amounts to nearly 1,000 gallons a day and dry neutral sulphate of ammonia six tons per day.

The Great Western Railway Station at Leamington is now in process of reconstruction. The Railway Company has decided on gas lighting for the platforms and approach to the Station, and the latter is to be carried out by means of eleven of Sugg's six-mantle upright "Rochester" lamps with clock controllers, on 15 ft. high octagonal cast-iron columns, by Smedley Brothers, of Belper.

Sales and Hire-Purchases were stated in a report by the Engineer and Manager, Mr. F. Blackburn, at a Meeting of the Plymouth Corporation Gas Committee on Thursday, Dec. 31, to have increased from 1,602 in 1934-35 to approximately 4,600 in the financial year just ended. An increase in output for November of 1·82% over the corresponding month of 1935 was also reported.

Sparks from an Adjoining Chimney igniting a bird's nest are believed to be the cause of an outbreak of fire at the Wigan Corporation gas showroom, Darlington Street, Wigan. Extensive damage was done to the roof and a large wooden sign over the front of the building was burned, while a number of joiners' tools were also destroyed as the result of burning debris from the roof falling inside the building.

The Gas Association of Czecho-Slovakia, in sending greetings for 1937, inform us that their 18th Congress will take place in Prague at the end of May and the beginning of June next. From May 22 to June 20 there is to be a gas, water, and technical hygiene exhibition, visits to which will be made in connection with the Congress. Other attractions will include special excursions in Prague and the neighbourhood, a visit to the National Opera, and a full social programme.

The New Showrooms of Clitheroe Gas Department in Castle Street are both attractive and convenient. The ground floor is devoted to cookers, portable fires, radiators, &c., with a special working display of hot water heaters. The first floor is for washing machines and cooking demonstrations, which commence on Jan. 18. These have been arranged by Radiation Ltd. The entire lighting has been carried out by the latest ventilating type gas lights, which are operated both by hand switches and clock controllers.

Further Enquiries have been received by the Ellesmere Port Council with reference to the purchase of the Local Gas Undertaking. The Law and Parliamentary Committee recommends the Council to give all reasonable facilities, including an inspection of the Works and the supply of data with regard to the Undertaking to lead to valuations being made at enquirers' own cost, to enable them to make offers for the purchase of the Undertaking, and that the Council be prepared to consider on their merits any offers so made, subject to their reserving the right to withdraw at any time from negotiations.

A Reduction in the price of gas has been decided upon by the Tain Town Council. The rate, formerly fixed at 9s. 7d. per 1,000 cu.ft., was one of the highest in Scotland. This figure will be reduced by 10d. to 8s. 9d. per 1,000 cu.ft. as from Nov. 1, 1936. The proposal to reduce the rate met with opposition when it was pointed out that the undertaking had an overdraft of £2,200 at the bank. A profit of £40 was made on last year's working, which, it was stated, did not justify a reduction. When the reduction was approved, Councillor Ross gave notice of motion that the Undertaking be advertised for sale.

Amalgamation and Grouping

Loughborough and Quorndon.

Subject to the approval of the Quorndon and Mountsorrel Gas, Coke, and Coal Company and the sanction of the Board of Trade, the Loughborough Gas Department are to take over the Undertaking and supply the area direct from the Loughborough Works by high-pressure main. The proposed amalgamation is to date from Dec. 3, 1937, at which date the Quorn gas-works will probably close down.

Severn Valley Ordinary Share Issue.

The right to subscribe for additional ordinary shares in the proportion of one new for every four ordinary shares held is offered to shareholders of Severn Valley Gas Corporation, the £1,500,000 holding company which controls 20 gas undertakings in the west of England. The new ordinary shares are being offered at 22s. for each £1 share as compared with the current market valuation of 22s. 9d. per share, so that the right to subscribe constitutes a small bonus to shareholders.

The authorized capital of the Company is divided into £700,000 in 4½% cumulative preference shares of £1 each, £600,000 in ordinary shares of £1 each, and £200,000 in deferred shares of £1 each. Of the preference shares £460,810 have been issued; of the deferred shares £100,000 have been issued, and the amount of ordinary shares outstanding is £441,275, making a total issued capital of £1,002,085. Dividends at the rate of 5% per annum have been paid on the ordinary and deferred shares of the Corporation since its inception under the auspices of Messrs. Dawnay Day & Co. in March, 1934.

It is announced that the Corporation has acquired control of a number of companies since the issue of the last accounts, and the proceeds of the issue of ordinary shares now being made will be used to reduce bank loans incurred in connection with these acquisitions. The Company has no debenture or loan capital outstanding. It is the policy of the Severn Valley Gas Corporation to finance its activi-

ties by the issue of preference or ordinary share capital, and not to create any mortgage, debenture, or other loan capital which would rank before the equity of shareholders.

Applications for new ordinary shares must be lodged by shareholders at the Transfer Office of the Corporation, 15, Moorgate, London, E.C. 2, on or before Monday, Jan. 18, 1937. The new shares rank for dividend as from Jan. 1, 1937.

United Kingdom and Layland.

Close Brothers, Secretaries of the United Kingdom Gas Corporation, Ltd., announce that the Corporation has acquired 87·3% of the ordinary capital of the Layland Gas Company.

The acquisition of the York (announced in these columns recently) and the Layland Companies is in accordance with the programme for the establishment of a gas grid in Yorkshire and the linking up of Gas Undertakings in the Lancashire area.

The total capitalization of the United Kingdom Gas Corporation is now:

Authorized.	Issued.
£1,000,000 4½% Cum. Pref. shares of £1 each	£936,336
£1 000,000 4½% Prefd. Ord. shares of £1 each	632,006
£1,000,000 Ord. shares of £1 each	750,000
	£2,318,344
Loan capital:	
£1,000,000 3½% deb stock	700,000
	£3,018,344

London and Southern Juniors

Visit to H.M. Fuel Research Station

A particularly interesting afternoon was spent by members of the London and Southern District Junior Gas Association on Saturday, Jan. 2, when some fifty of them paid a visit to H.M. Fuel Research Station at East Greenwich.

The visitors were welcomed in the name of Dr. F. S. Sinnatt, Director of Fuel Research, Department of Scientific and Industrial Research, by Capt. J. FRASER SHAW (Chief Engineer under the Department), who gave a brief outline of the development and present activities of the Department. He explained at the outset that the Government are responsible for the financing of the Department to the extent of some £80,000 per annum, of which about £50,000 is spent on behalf of the National Coal Survey—so that a little under half the total is spent at the Fuel Research Station at East Greenwich. A certain amount of the work, it is understood, including most of that carried out at the National Physical Laboratory at Teddington, is of a self-supporting nature. Indeed, the cost of the 8,000 tons of coal required annually at the Fuel Research Station is largely offset by the sale of the residuals produced.

As regards personnel, Capt. Fraser Shaw explained that under the Director there are twelve engineers and about 50 to 60 chemists, physicists, and geologists (half of whom are in training), as well as a clerical staff of over twenty. There are about 120 workmen in regular employment at the Station, of whom 30 are mechanics and the remainder labourers. Many of these men are specially trained, and receive additional remuneration, for specialized operations in which they are engaged.

All the work carried out at the Fuel Research Station is on full-scale lines, and all the plant has been laid out with commendable foresight. For the reception of coal and dealing with other raw materials the Board have a branch line from the sidings of the South Metropolitan Gas Company's East Greenwich Works. It should be mentioned that the site for the Station, covering some six acres, was primarily chosen by reason of its proximity to these gas-works, from whom the Government rent the land at a "peppercorn" rent. Moreover, such gas as is produced at the Station which is not required for their own purposes is pumped direct to the South Metropolitan Company.

Fully Equipped Gas-Works.

The Fuel Research Station contains a fully equipped gas-works, and the tests which are undertaken there are, in the true sense of the term, large-scale investigations. On the horizontal retort installation a considerable amount of steaming has recently been carried out, and it is interesting to observe how little effect this has had upon the retorts. Other carbonizing plant includes two settings of continuous vertical retorts—one of which is worked at high temperatures and the other at low temperatures—two "W.-D." chamber ovens which at the time of the visit were in process of heating up, and water gas plant. Each batch of coal is stored separately—and it is rather surprising to note that coal is not stored under cover. The coal subsequently passes through the processes of crushing, cleaning, drying, and sampling. The importance of taking a really representative sample of a coal consignment is fully recognized by the Board, for all the accuracy and refinement of subsequent tests are of little avail if the sample is not a true one; it is neither more or less than waste of time to ascertain, say, the carbon content to two places of decimals if due regard has not been paid to the fundamental of the test—the sample.

Researches into the use of pulverized fuel in small combustion spaces has led to some useful conclusions, and the visitors were able to see the arrangement which has been devised for arresting the dust on one of the boilers. Much of the success of this process of burning pulverized fuel is dependent upon evenly dividing the stream of coal. Considerable interest was evinced in the devices (referred to on p. 847 of the "JOURNAL" for Dec. 23 last) for enabling high-temperature coke to be burned in the ordinary domestic grate. A grate such as the one illustrated was shown in operation. It would seem, however, that where such a device calls for a moveable canopy it is still unsuitable for the latest types of all-tiled fireplaces.

Much useful work has been in progress for several years past at the Fuel Research Station on the hydrogenation of coal and tar, more recent researches having been concentrated upon the latter with the object (*a*) of producing fuels for all types of internal combustion engines; (*b*) of producing satisfactory lubricating oil from indigenous material; and (*c*) of obtaining an insight into the constitution of coal and tar. A comprehensive Paper on the hydrogenation of low-temperature tar and tar products at the Station was given by Dr. Sinnatt before the Midland Association in November, 1934 (see "JOURNAL" for Nov. 7 of that year), illustrations of the plant being included. Experiments are also being carried out on the hydrogenation of various other materials, including rubber—so that we may one day see motorists running their engines on their worn out tyres!

The items of interest in the laboratories are far too numerous to enumerate here. One large room is devoted to analytical work, and in this connection must be mentioned the Gray-King apparatus for the assay of coal, from which a very useful collection of coke samples have been obtained. Much valuable research and analytical work on the various raw materials and carbonization products is also carried on.

The Coal Survey.

Some interesting particulars of the National Coal Survey were given by Mr. COLLINS, of the Fuel Research Station staff. This embraces a survey and classification of the coal seams in the various mining districts by means of physical and chemical tests in the laboratory, supplemented by large-scale tests where desirable. The Headquarters of this organization is the Fuel Research Station at East Greenwich, while there are local laboratories in each of the coalfields under the control of chemists, who have a small staff at their disposal. These local centres are directed by Committees representative of the colliery owners and managers, the local branch of the Institution of Mining Engineers, the Fuel Research Board, and the Geological Survey of Great Britain, as well as outside scientific interests. Each Committee is charged with the duty of supervising the work of the physical and chemical survey in a coal mining area, and in this way the survey becomes of practical value from the commencement, since local knowledge and experience are made available, and the seams to be investigated and the general programme of work are decided by those who are able to estimate most correctly the relative importance of the problems to be solved. The seams undergo physical and chemical examination by investigators appointed for the purpose, after which a final selection is made of those seams likely to justify experiments on a technical scale in order to test their suitability for practical uses or methods of treatment.

Mr. Collins showed various samples of different types of coal, indicating how deceptive external appearances could be. He also demonstrated how lines of equal volatile content could be plotted over a whole coalfield—and similarly with sulphur content, &c. The results of these analyses,

he observed, were finally published for the benefit of those interested and provided a unique assembly of knowledge in regard to the whole coal resources of the country.

At the conclusion of the inspection of the Station, tea was provided through the kindness of Dr. Sinnatt, to whom —and also to Capt. Fraser Shaw and the guides—the PRESIDENT (Mr. R. Summerson, of Luton) expressed the cordial thanks of the Association for a most interesting and instructive visit.

Coal and Allied Industries, Ltd.

Winding-Up Resolution

At a meeting on Dec. 31, the Earl of Eldon, Chairman of Directors, told shareholders of Coal and Allied Industries, Ltd., a Company formed to extract oil from coal, that its funds were exhausted and there was no money to carry on.

At this meeting a winding-up resolution was submitted. After remarking that the Directors had financed the Company to the extent of some £7,000, he said they would be delighted to postpone the meeting as had been suggested. Funds, however, would have to be found to pay salaries and meet other items.

When the resolution to wind-up the Company and appoint a liquidator was put, none of the shareholders voted for it.

Mr. A. P. Godfrey, a shareholder, moved an amendment, which was carried, adjourning the meeting until Jan. 28 and appointing a committee of investigation of three shareholders.

British Standard Specification

Sheet Metal Flue Pipes for Gas-Fired Appliances

Everyone concerned with the design, construction, or installation of gas-fired appliances will learn with interest of the issue by the British Standards Institution of a new British Standard entitled "Sheet Metal Cylindrical Flue Pipes Fittings and Accessories for Gas-Fired Appliances." This Specification has been prepared under the authority of the Gas Industry Committee of the B.S.I., Mr. S. F. Dunkley being Chairman of the Technical Sub-Committee.

The Specification incorporates requirements relating to quality and dimensions of metal flue pipes and accessories of nominal sizes from 2 in. to 6 in. inclusive, having welded or folded seams and finished by polishing, vitreous enamelling, electro-deposition, galvanizing, or galvanizing and painting. All the types of fittings in common use are included, while dimensions are also given for adaptors for connecting metal flue pipes to asbestos cement flue pipes conforming to the B.S. Specification No. 567.

Particular attention is given in the specification to the question of the quality of finish, and a number of tests are included for confirming that the enamel coating, galvanized coating, and paint coating are of the requisite standard of quality.

Copies of the above Specification No. 715-1936 may be had from the British Standards Institution, Publications Department, 28, Victoria Street, S.W. 1, price 2s. each (2s. 2d. post free).

Athletic and Social

Chesterfield Annual Dinner.

Mr. R. C. Green, Sales Manager for the Chesterfield Corporation Gas Department, who has resigned to take up an appointment as Sales Manager with Messrs. J. King & Son (Enamellers), Ltd., Chesterfield, was on Wednesday, Dec. 30, presented with an oak bookcase by members of the Department.

The presentation was made by Alderman G. Clark (Chairman of the Gas Committee) at the annual dinner of the Gas Department, which was held at the Victoria Café, Chesterfield. Alderman Clark presided, and among those present were Alderman A. W. Swale (Vice-Chairman of the Gas Committee), and Mr. H. Davies (Engineer and Manager).

Mr. J. Lowry, in proposing the toast of "The Gas Department," said the last ten years had seen many improvements and additions to the Gas-Works at Chesterfield, a fact which was mainly due to so worthy a chief as Mr. Davies.

Mr. Davies, in reply, said that 17 years ago the annual output of the Gas Department was 220 million cu.ft., and this year it would be 600 million cu.ft. He acknowledged the work of the staff. The sale of gas had become more important even than its manufacture. That was why so many members of the outside department were there that night.

Alderman Swale, who also responded, hoped that the good fellowship which prevailed among, and the good relationship which existed between, the Staff and the Committee and Mr. Davies would continue and grow even better in the future.

In making the presentation, Alderman Clark asked Mr. Green to accept the bookcase as a token of their esteem and good wishes. Mr. Green suitably replied.

Trade Notes

Detel Products, Ltd.: Corrosion Resisting Undercoat.

The Detel metal (zinc) undercoat is specially prepared for the protection of iron and steel, and the manufacturers, Detel Products, Ltd., Long Drive, Greenford, Middlesex, claim that it is the most efficient agent for the prevention of corrosion that can be applied with a paint brush. It is readily applied, dries quickly, and gives a coat containing over 90% of metallic zinc in electrical contact with the underlying metal. Corrosion is absolutely prevented under D.M.U., the makers claim, and no "creep" of rust, that so frequently occurs under apparently sound paint films, is possible. The D.M. undercoat was used with great success, inside and outside, on the hull of the famous yacht "Endeavour II."

A New Room Thermostat.

Possibly the most serious problem in the automatic control of room temperature arises from the fact that control must be exercised from one point, and that it is not an easy matter to ensure that the temperature at the position selected for the thermostat shall represent the mean conditions in the room. Naturally, the heating engineer will seek a position remote from the actual source of heat and from windows and doors, and as far as possible one which is not subjected to other abnormal conditions. But in the majority of instances the thermostat must be mounted on a wall and investigations have shown that wall temperature cannot be considered as representative of the average room temperature.

Unless the external temperature is identical with the desired room temperature, there will be a heat exchange between the inside and outside surfaces of the wall, the direction of the heat flow, and consequently the wall temperature with respect to the room temperature, depending upon conditions. Another factor making for unfavourable control conditions is that there is a vertical cushion of air, extending some one-and-a-half inches from the wall surface, which, by reason of the heat exchange already mentioned and the existence of convection currents arising therefrom and from other causes, is subject to variations.

To avoid these sources of error, the British Thermostat Company, Ltd., has recently introduced a new design of room thermostat, known as type RT. It is of the bi-metallic type, with magnetically-assisted quick make and with contracts rated to carry up to 10 amperes at 250 volts A.C. or 1 ampere at 260 volts D.C. The important features of the design are, first, that the sensitive element is spaced sufficiently far from the wall to avoid the air cushion; second, the contact area between the back-plate and the wall is small and the conductive heat-path between the back-plate and the main body of the instrument housing is at the top of the instrument so that conducted heat, already reduced to a minimum, cannot affect the sensitive element. The thermostat is contained in a vertical bakelite tube, open at the top and bottom to permit free circulation of air and thus to assist rapid operation. The switch contacts and connections, at which a certain amount of heat might be generated, are also located in the top of the housing, and therefore cannot affect the bi-metallic element, their only action, indeed, being to encourage the flow of convection air currents through the instrument; and in one model a small subsidiary electric heating element is actually incorporated in the instrument head to increase the air circulation.

The RT room thermostat has an adjustable setting scale, the standard range being from 45° F. to 75° F., and operates on a differential of 3° F. with the standard setting of 1° F. if desired with the fine setting. If required, a locking device can be fitted to the setting scale to prevent unauthorized interference.

Sheffield and Barnsley

Support for Buying of Barnsley Undertaking

According to a *Financial Times* correspondent, supporters in Barnsley of the Sheffield Gas Company's proposal to buy the Barnsley Gas Company have signed a demand for a poll of the electors with the object of overriding a decision of the Barnsley Town Council and a town's meeting to promote a Bill in Parliament to authorize the Barnsley Council to acquire the Undertaking.

The purchase price which the Sheffield Gas Company proposes to pay is understood to be £168,000.

New Kitchens for Old

Walter King, Ltd., publishers of the "GAS JOURNAL" and the "GAS SALESMAN" arranged for the compilation of a booklet called New Kitchens for Old, *which, specially edited for the purpose by an expert, is intended to be read by ordinary housewives and explains in a simple way the basic principles of kitchen planning.*

Women to-day are "kitchen-conscious." They are critical of the shortcomings of their own kitchens and are keen students of the rapid progress that has been made in the fundamentals of kitchen design and the application of new ideas and new materials to kitchen equipment.

To verify this statement it is only necessary to watch the flow of traffic at such a show as the Ideal Home Exhibition. On normal afternoons the number of visitors to the model houses and model kitchens is so great that the crowds have to be assembled in queues which would rouse the envy of a West End theatre manager. There are no such queues to inspect the exhibits of individual manufacturers. Why?

Again, if you glance through the home pages of any woman's magazine you are likely to find descriptions of ideal kitchens and well-informed incisive criticism of existing kitchens. At one time these home pages were consigned to the end of the magazine. Now they vie with the short stories and feature articles for favoured positions. This is no accident. Magazine editors hold their jobs by keeping a shrewd eye on the changing interests of the reading public.

Not long ago the universally respected and socially powerful National Council of Women issued a leaflet on the planning of kitchens. The leaflet was the result of several months' work by a committee of women experts. Its findings were taken very seriously by professional builders, and the leading periodical of the building industry published the report in full.

There are plenty of sound reasons for the growing interest which women are showing in the planning of kitchens. The root reason is that they no longer regard the kitchen arrangement as something fixed and unalterable. That idea was a relic of the times when the inescapable focal point of every kitchen was the coal range.

Post-war developments have changed all that. Three million new houses have been built since 1920. Many of those built by municipalities or with the help of subsidies have been designed by well-known architects who were, by reason of the immense scale of the work, able to take advantage of the economies of mass production. In consequence the kitchens in some of the new blocks of workers' flats and housing schemes are greatly in advance of the existing kitchens in most middle-class homes.

Every woman has some friend or acquaintance who has moved into a new house, and that is one reason why so many women have become dissatisfied with their own kitchens and anxious to bring them up to date.

The Kitchen Sells the Houee.

As for the activities of speculative builders, an architect has pointed out that the lavish use of modern materials and equipment in new houses built for sale has been confined almost entirely to two rooms—the kitchen and the bathroom. It is often said that "the kitchen sells the house." In one estate of houses costing less than £500, refrigerators have been installed as standard fittings in every kitchen. Speculative builders are realists, not philanthropists. They have grasped the fact that the desire for a smart kitchen with up-to-date fittings may be the deciding factor when a woman hesitates about taking a house. Hence in some cases there has been an uncommon degree of collaboration between the builder, the cabinet-maker, and the gas or electric undertaking, resulting in kitchens in which the sink, refrigerator, and cooker are all built into one fitment.

The problem, however, is not restricted to new houses. The desire for better kitchens, with modern appliances and fittings arranged in a logical scheme, has been effectively roused in all classes of women, and for a large proportion of them a new house is out of the question. But to many of these the idea of a renovated and re-modelled kitchen makes a strong appeal.

Obviously this attitude is of great importance to all suppliers of domestic equipment. Messrs. Lever Brothers have already turned it to account in their campaign for home laundry. Their object is to increase the sale of their product among women who wash clothes at home. They recognized that the best way of making home laundering more popular was to show that the work could be made much easier if the necessary appliances were placed in logical order in the kitchen. A great deal of research was carried out at Port Sunlight and as a result a Kitchen Planning Service was launched. This Service has in many cases been operated through gas and electric undertakings.

The Industry's Surest Foothold.

It would be bad policy if the Gas Industry were to lag behind in this matter, since its surest foothold is in the kitchens of the nation. It is an encouraging fact that many women are anxious to have authoritative guidance on the choice of kitchen fittings and the arrangement of appliances in relation to each other. Surely it is the Industry's concern to take the lead in supplying information and advice, so that the planning or re-modelling of kitchens will be automatically associated with gas service. A consumer who can be interested in the problem of the kitchen as a whole deserves the most careful attention. In four cases out of five, she already uses gas for cooking. But if she has been led to consider the re-organization of the whole kitchen, even at long range, she is a prospect for other appliances too—water heater, washing machine, and possibly refrigerator.

Many gas undertakings have already broached the question. It is now quite common to see model gas kitchens in showroom windows, in demonstration rooms, and at exhibitions. In some cases advice on kitchen problems is offered by Home Service departments.

So far, however, the Gas Industry as a whole has not actively and persistently associated itself with the movement towards planned kitchens. From time to time there have been demands for a booklet which would summarize suggested ideas on kitchen planning and would at the same time show the important part that modern gas service plays in arriving at the ideal arrangement.

To meet this need, Walter King, Ltd., publishers of the "GAS JOURNAL" and the "GAS SALESMAN," arranged for the compilation of a booklet called *New Kitchens For Old*, and specially edited for the purpose by an expert. *New Kitchens For Old* is intended to be read by ordinary housewives. It explains in a simple way the basic principles of kitchen planning, and shows how they have been applied to various common types of kitchen. Each phase is illustrated by plans and photographs.

Throughout the book the advantages of gas appliances have been kept in mind. One chapter deals wholly with the choice of kitchen furniture and appliances. Other sections deal with colour schemes and coverings for walls and floors. To the best of our knowledge, this is the only booklet of its kind to be devoted wholly to this subject.

New Kitchens For Old is now on sale, and an illustrated announcement will be found on p. 21 of our issue to-day. We are confident that when gas managers have read the booklet they will wish to circularize it to their consumers.

Disperse Systems in Gases

Dust, Smoke, and Fog

From April 20 to 22, 1936, the 64th General Discussion of the Faraday Society took place at the University of Leeds, when the subject of "Disperse Systems in Gases; Dust, Smoke, and Fog" was considered under two heads, as follows:

Part I.—The general properties and behaviour of disperse systems composed of (*a*) solid and liquid non-volatile particles (smoke, dust, oil fogs, &c.) and (*b*) aqueous and other volatile particles (mist, cloud, hygroscopic nuclei, town and country fogs).

Part II.—The industrial aspects of disperse systems in air and gases.

The Report of the meeting, including all the Papers contributed, together with the discussions, has been published by the Faraday Society, 13, South Square, Gray's Inn, London, W.C. 1, price 12s. 6d. (postage: inland 6d., foreign 8d.).

The Behaviour of Sulphur

DURING CARBONIZATION

Since the Author contributed an article to the "JOURNAL" for Jan. 1, 1936, on the elimination of sulphur from coal he has received several communications from America on the subject. In the present article he reviews a recent Paper by Dr. Gilbert Thiessen.

by

Dr. G. E. FOXWELL

Several communications from America have reached me relating to an article contributed to the "GAS JOURNAL by me in the issue of Jan. 1, 1936, upon the subject of the elimination of sulphur from coal. In considering possible methods of sulphur elimination, an operation which may one day be found to be necessary to prevent contamination of the atmosphere by sulphur acids, an account was given of the sulphur compounds present in coal and coke and, in particular of the reactions which these compounds undergo during carbonization. It was shown that the published results of many workers, notably of A. R. Powell, led to the conclusion that pyrites decomposed completely by 500° C. with liberation of sulphur and formation of pyrrhotite—a mineral varying in composition from Fe_5S_6 to $Fe_{11}S_{12}$. As would be indicated from this change, the original pyritic sulphur content of cokes is reduced by carbonization to nearly 50%—actually a little more—of that initially present.

Sulphur is not present as sulphides before carbonization, and only in weathered coals is there any appreciable quantity of sulphate present. Organically combined sulphur shares with pyritic sulphur the doubtful honour of responsibility for the occurrence of this element in coal. Experimental evidence suggested that organically combined sulphur was not easily liberated from coal unless free hydrogen is present when the liberation of sulphur, which in absence of hydrogen ceases at 600° C., continues with increased rapidity at higher temperatures. The evidence, however, was not very conclusive. Powell believes that some 25 to 33% of the organic sulphur is liberated, for the most part below 500° C. On the other hand, his experimental results quoted for Tennessee coal show that some 30% of the organic sulphur had been evolved at 400° C., but that organic sulphur compounds were subsequently reformed to some extent, and decomposition ceased so that the finished coke at 1,000° C. contained a slightly higher percentage of sulphur than did the initial coal; taking into account the concurrent elimination of volatile matter, this is still not inconsistent with a general decomposition of organic sulphur compounds of the order of 30%. With Pocahontas coal, on the other hand, the organic sulphur content of the coke fell to very much less than that of the coal, and it would appear that the decomposition was of the order of 45%.

Among the communications received relating to this problem is an important Paper by Dr. Gilbert Thiessen, of the Illinois State Geological Survey, recording the results of a study of 82 samples undertaken to correlate the distribution of the sulphur between the volatile matter and the coke with the distribution of that element in the coal in the several forms in which it is present; and to discover a method of estimating the probable sulphur content of coke from a prior knowledge of the sulphur content of the coal and of the distribution of the sulphur therein. Dr. Thiessen records that the information contained in the literature on the subject is to the effect that (1) about half the sulphur in the coal appears in the coke, but the percentage of sulphur in coke will be about 80% of that present in the coal initially, on account of the evolution of volatile matter; (2) there is no unanimity of opinion as to the relative importance of organic and inorganic (pyritic) sulphur as a source of sulphur in the coke; (3) the sulphur found in the coke appears to be directly proportional to the total sulphur content of the coal from which the coke was made.

Method of Investigation.

The method of investigation was to carbonize small amounts of coal in a platinum crucible in accordance with the A.S.T.M.'s standard procedure for the determination of volatile matter. From a practical point of view this method is open to the objection that the influence of hydrogen is neglected. Many important secondary reactions are due to hydrogen travelling up the hot coke in the coke oven or gas retort, these reactions particularly resulting in the elimination of sulphur from the organic sulphur compounds. The experimental method, however, enables the primary reactions to be followed, even if further work be needed to enable it to be applied with certainty to practical conditions.

It was found that the average sulphur in the coke as determined was 0·83 times that of the sulphur in the coal; there was, however, quite a considerable variation from the average figure, the actual factor varying from 0·695 to 0·982. Further to analyze these results, it was found that the plotted figures would fall into two groups. In one series there was a group of samples having varying total sulphur contents, but an organic sulphur content remarkably uniform and in the neighbourhood of 0·5%. The other group also possessed varying total sulphur contents, but the organic sulphur content—again constant—was 1·5%. The experimental figures thus were similar to two simultaneous mathematical equations from which the variation in the pyritic sulphur content and in the organic sulphur content during carbonization could be calculated. It was thus found that on a coal basis the amount of pyritic sulphur retained in the coke varied only as between 61 and 63%, while the organic sulphur retained had the greater variation of between 37 and 52%—possibly an effect of hydrogen treatment. Dr. Thiessen concludes that in round figures 62% of pyritic sulphur and 45% of the organic sulphur is retained in the coke, but it must be emphasized that the organic sulphur figures may vary considerably. The general conclusion was drawn from this work that about half the sulphur content of coal remains in the coke, and because of the loss of volatile matter, the amount of sulphur in the coal is approximately 80% of that in the original coal.

It is not altogether certain that this conclusion is justified in its entirety, because, as has been pointed out, the extent of decomposition of the organic sulphur compounds is not constant, for more than one reason. One clear conclusion that seems to follow legitimately from Dr. Thiessen's work is that the decomposition of pyrites, FeS_2, under conditions of rapid heating in a crucible, and therefore without any long exposure to heat, is to the higher-sulphur form of pyrrhotite, Fe_5S_6; this reaction would agree with the retention of 60% of pyritic sulphur in the coke, 40% passing into the gas mostly as H_2S. Pyrrhotite appears not to be greatly affected by subsequent heating, but may react with carbon in the coke, causing transfer of sulphur from the inorganic form to the organic.

An interesting extension of pre-existent work on sulphur is the examination of the behaviour of the individual banded constituents, fusain, clarain, and vitrain; unfortunately durain, which accounts for the bulk of so many coals, was not examined. It is, of course, unsafe to make generalizations unless a very large number of coals from different seams and from different coalfields have been examined, a condition which is not fulfilled in the results given in the particular Paper under review. Nevertheless, so far as can be seen from the examination of not more than eight samples, of which five of the clarains and three of the fusains were from the same seam, it can be said that fusain owes its sulphur content to pyrites; a recalculation of the sulphur contents on a percentage basis is given in Table 1, and shows only one marked exception to this rule. An exception would be expected to occur when a fusain was encountered which was especially free from iron.

TABLE 1.—*Distribution of Sulphur in Fusain.*

Total Sulphur, % by Weight.	S. as Sulphates, % of Total.	S. as Pyrites, % of Total.	S. as Organic Sulphur, % of Total.
0·45	2·4	60	37·6
2·34	2·5	74·7	22·8
0·99	3·0	70	27
0·70	5·7	23	71·3
1·42	3·5	67·5	29
8·71	2·7	88·7	8·6
3·10	75		25

TABLE 2.—*Distribution of Sulphur in Vitrain.*

Total Sulphur, % by Weight.	S. as Sulphates, % of Total.	S. as Pyrites, % of Total.	S. as Organic Sulphur, % of Total.
1·78	1·7	19·6	78·7
2·33	37·3		62·7

TABLE 3.—*Distribution of Sulphur in Clarain.*

Total Sulphur, % by Weight.	S. as Sulphates, % of Total.	S. as Pyrites, % of Total.	S. as Organic Sulphur, % of Total.
0·75	*Nil*	30·7	69·3
2·46	0·4	31·4	68·2
4·02	0·2	37·5	62·3
4·18	0·2	37·5	62·3
4·67	0·4	45	54·6
3·54	0·3	38·5	61·2
3·15	0·6	35·3	64·1
3·57	52·5		47·5

Table 2 gives some indication that vitrain owes its sulphur content primarily to organic sulphur.

Table 3 indicates that clarain owes two-thirds of its sulphur content to organic sulphur and one-third to pyrites.

These conclusions are interesting when considered in association with the composition of the banded constituents. Vitrain is essentially a colloidal gel containing no recognizable plant remains; clarain consists of a colloidal gel matrix in which are embedded a certain proportion of plant remains; in durain, the plant remains preponderate; fusain is unfermented woody tissue, different from the plant remains in the other banded constituents. A coal microscopist might object to the precise wording of this definition on the ground that vitrain is not entirely structureless, but substantially it represents the practical differences between the banded constituents. It is perhaps permissible to suggest that for the most part the pyrites has been "entrapped" in the plant remains when the coal measures were forming, and that the organic sulphur compounds are primarily to be found in the gel matrix. Some pyrites will doubtless have been "floated" into the matrix when the plant remains decomposed, but the greater part will have been left behind in the plant remains where it may have re-crystallized into the form in which we now know it during the millions of years it has remained in the coal measures. Probably the plant remains may contain some organic sulphur compounds, but for the most part the sulphur—perhaps derived from the pyrites—appears to have reacted with the oils and other non-crystalline compounds derived from the coal plants upon fermentation or decomposition. A good deal more work, however, is necessary to establish beyond question the location and origin of the sulphur of coal, and until that work has been done we can only take it as tentatively proved that most of the pyritic sulphur is contained in those portions of the coal which are richest in plant remains, and that the organic sulphur is for the most part contained in the gell matrix, in which are also to be found those constituents which most assist coke formation. The fact is worthy of note; there is no means of turning it to practical application now, but some day it may be important in the manufacture of low-sulphur coke, since the organic sulphur is peculiarly susceptible to react with hydrogen, and thus to be eliminated from the coke.

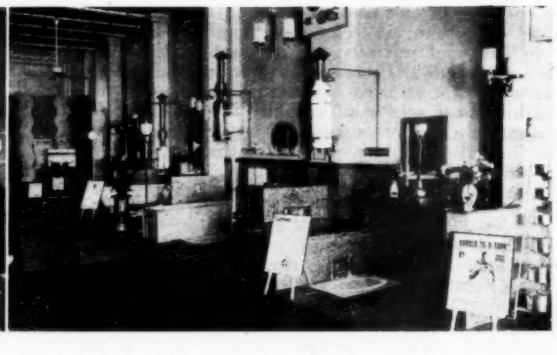
An observation of peculiar interest in connection with the problem of producing low-sulphur cokes is that of Dr. Thiessen on weathering. By analysis of a coal which originally contained 3·78% of sulphur made up for the most part of 1·79% of pyritic sulphur and 1·91% of organic sulphur, it was found that increasing weathering reduced the pyritic sulphur content to 0·15%, but left the organic sulphur virtually unchanged. The total sulphur content of the weathered coal then became 2·05%. Such coal, even if it once coked, would do so no longer. It happens, however, that we are now witnessing the development of processes off carbonization that claim to produce strong coke at economic prices from non-coking coal. We may, perhaps, prophetically visualize the coke of the future as being made from weathered non-coking and carefully leached coal (leached to remove iron which would retain volatile sulphur), carbonized in continuous retorts in a stream of gases rich in hydrogen, and yielding a resulting product containing but trifling amounts of sulphur. The contamination of the atmosphere by oxides of sulphur and sulphur acids, which are the prime cause of the decay of materials, would then be greatly reduced, since town gas is already nearly free from sulphur—and will be yet freer in the future—and all power stations will, when that day comes, be compelled by law to remove dust and sulphur from their waste gases.

It is to be hoped that Dr. Thiessen, Mr. Powell, and their collaborators in America will continue their very valuable work on sulphur in coal and coke, and that parallel work will be undertaken in this country on British coals.

ATTRACTIVE NEW GAS SHOWROOMS

Opened at Colombo

On Nov. 10 the Colombo Gas and Water Company, Ltd., opened new showrooms in the Fort District of Colombo. The premises are situated in Chatham Street, which is regarded as the "Bond Street" of the town.



The new showrooms at Colombo, three views of which we reproduce above, have been much admired, not only for the artistic scheme of decoration, but also for the effective manner in which the wide range of modern gas appliances has been arranged. The island of Ceylon now has in these premises a gas showroom as up-to-date as any in the Home Country or elsewhere, an achievement on which the Company are to be congratulated.

British Sulphate of Ammonia Federation

Annual Report for 1935-36

The following figures are offered as fair estimates, but strict accuracy is not claimed for them. The estimates for 1934-35 have been slightly revised. The percentage increases or decreases as compared with the previous year are shown in italics.

World Production and Consumption of Pure Nitrogen for the Fertilizer Years

[In Thousands of Metric Tons.]

—	1933-34.	1934-35.	1935-36.
Production—			
Sulphate of ammonia—			
By-product	307	321	365
Synthetic	535	533	630*
	842	854	995*
Cyanamide	195	232	270*
Nitrate of lime	107	153	156*
Other forms of nitrogen†—			
Synthetic	516	607	720*
By-product	48	45	45
Chile nitrate	84	179	192
Total production	1,792	2,070	2,378*
Percentage increase or decrease	*+ 6·9*	*+15·5*	*+ 14·9*
Consumption—			
Manufactured nitrogen	1,714	1,876	2,182*
Chile nitrate	164	195	218
Total consumption	1,878	2,071	2,400*
Percentage increase or decrease	*+ 7·5*	*+ 10·3*	*+ 15·9*
Agricultural consumption about	1,673	1,812	2,068*
Percentage increase or decrease	*+ 5·5*	*+ 8·3*	*+ 14·1*

* Record.
† Including nitrogen products used for industrial purposes (except Chile nitrate) and ammonia in mixed fertilizers.
NOTE.—Fertilizers are included in these tables under the final form as sold, so that, for example, cyanamide if converted into sulphate of ammonia is included under synthetic sulphate of ammonia, or, if into ammophos, is included under other synthetic nitrogen.

During the year under review it is estimated that there was an increase of 308,000 metric tons of nitrogen, or about 14·9%, in the actual production of the forms of nitrogen enumerated above. The production in Chile increased by 13,000 tons, or 7%, and output in other countries increased by 295,000 tons, or 16%. As indicated by the asterisks, 1935-36 was a record year for the output of most of the products shown.

The most marked increases in manufactured nitrogen output have been in Germany, Japan, the U.S.A., and Russia.

Synthetic nitrogen plants have on an average operated at only about 48% of capacity during the year; the world production capacity for synthetic nitrogen, including cyanamide, is estimated at 3,700,000 tons of nitrogen.

The total consumption increased by 329,516 tons, or about 15·9%, following an increase of 10·3% last year.

The increase in fertilizer nitrogen consumption was 256,000 metric tons, or 14·1%, as compared with 8·3% in the previous year. Each main class of fertilizer showed an increase; ammonium sulphate (including ammonia for mixed fertilizers) increased by 102,974 tons of nitrogen, or 11·4%, over the 1934-35 figure.

In individual countries, the largest tonnage increases in nitrogen consumption have been mostly in the same countries as last year—viz., in Germany, the U.S.A., Japan, Italy, Russia, France, and Egypt.

The order of importance in the production and consumption of nitrogen for agricultural use is roughly as follows: Ammonium sulphate, 48% of all fertilizer nitrogen; cyanamide, 12-13%; Chile nitrate, 9-10%; lime ammonium nitrate ("Nitrochalk" forms) and calcium nitrate, each 7-8%; and other synthetic nitrogenous fertilizers, 13-15%. Thus, in spite of the rapid increase of synthetic nitrogenous fertilizers (other than sulphate) in recent years, and the revival of Chile nitrate, ammonium sulphate retains its predominance.

The rapid increase in the production and consumption of nitrogen for industrial purposes is noteworthy. This is, of course, influenced by quite different causes from those, such as the relative prosperity of the farming community, which affect the fertilizer nitrogen consumption. An unascertainable but large proportion of the consumption for industrial purposes is for explosives manufacture.

The international agreements mentioned in earlier Reports continue to operate satisfactorily and in particular enable the rapid adjustments necessitated by the fluctuations of demand and by the ever-increasing complexities of exchange control, quotas, and tariffs to be smoothly and equitably effected.

Home Production.

The figures in the following table showing the total production of ammonia products, expressed as sulphate, are calculated on the basis of 25% ammonia (about 20·6% nitrogen). The figures for sulphate of ammonia production, however, apply to actual tons of product with a nitrogen content varying from an average of about 20% in the earlier years to about 21% in recent years. Some of the estimates for earlier years have been revised.

Production of Ammonia Products and of Ammonium Sulphate in the British Isles.

[Tons of 2,240 lb.]

Calendar Year.	Total Production of Ammonia Products, Expressed as Sulphate of Ammonia Equivalent (Basis 25% Ammonia).*				Included in the Total.	
	England and Wales.	Scotland.	Ireland.	Total Great Britain and Ireland.	Industrial Ammonia Products (Basis 25% Ammonia) about	Sulphate of Ammonia as such (Actual Tons of Product) about
1933.	647,149	41,669	4,137†	692,955	88,500	580,700
1934.	560,526	45,522	3,961†	610,009	112,400	448,500
1935.	560,835	47,650	4,064†	612,549	113,800	448,000

* 25% ammonia = 20·6% of nitrogen (approx.). The figures for total production of ammonia products are recalculated from the Alkali Inspectors' Reports, except for the estimates shown. The Alkali Inspectors' Reports included Ireland up to 1921, so that to obtain comparable totals estimates for Ireland have been included for the years 1922-1935.
† Estimated.

Home consumption of sulphate of ammonia showed an increase on the 1934-35 figures of 10,200 tons, or 4·9%, following an increase of 0·7% in the previous year. Prices

Great Britain and Ireland and Channel Islands.

[Tons of 2,240 lbs.]

Fertilizer Year.*	Total Production of Sulphate of Ammonia as such.	Agricultural Consumption of Sulphate of Ammonia in—				Agricultural Consumption of Chile Nitrate.†	Sulphate of Ammonia.	
		England, Wales, and Channel Islands.	Scotland.	Ireland.	Total British Isles and Channel Islands.		Exports from—	Imports into—
							Great Britain and Ireland other than to or from the Channel Islands.	
1933-34	510,000	126,800	47,700	33,500	208,000	22,000	301,460	1,666
1934-35	434,000	129,900	45,200	34,400	209,500	26,000	247,081	5
1935-36	411,000	134,400	45,500	39,800	219,700	30,000	199,569	4

* Years ended June 30. † Estimated.

N.B.—The total consumption of Chile nitrate is estimated at 39,400 tons, as against 33,400 tons for last season.

were the same as in 1934-35. The increase in the consumption in England and Wales was 3·5%, in Scotland 0·7%, and in Ireland 15·7%, this last being due in part to the larger areas under wheat and beet in the Free State and the improved prices for potatoes and grass seed in Northern Ireland.

The detailed figures are given at the foot of the previous page. Estimates for earlier years have been slightly revised.

The total consumption of pure nitrogen in the British Isles for all purposes amounted to about 91,700 metric tons against 81,300 tons last year, an increase of 12·8%. The tonnage used in industry is estimated at 29,500 tons, against 24,200 last year.

Exports.

Total exports of ammonium sulphate from Great Britain and Ireland show a decrease of 47,248 tons, or about 19% on last year's figures.

The following figures show the shipments to the principal markets:

[Tons of 2,240 lb.]

—	1933-34.	1934-35.	1935-36.
Spain, Portugal, and Canaries	114,585	93,349	33,254
Japan	64,315	7,025	201
China and Hong Kong	13,441	6,950	12,221
West Indies, British Guiana, and Mauritius	22,534	25,361	34,626
India and Ceylon	51,274	58,172	58,621
Australia and New Zealand	13,285	18,781	30,034

Propaganda Work.

Speaking generally, the fertilizer season closed on a less optimistic note than it opened so far as agricultural prospects are concerned. While the capital financial position of most farmers has been considerably improved, it appears probable that their income for the coming agricultural year will be less than that for 1935-36.

The unsatisfactory position of the beef industry still overshadows the picture and, although certain long-term proposals are under immediate discussion, it is improbable that any material benefit will arise in time to affect the farmer's purchasing power in the spring months during which he requires fertilizers.

The average agricultural price index for the year ended June, 1936, was 116·25 compared with 115 for the year ended June, 1935. If payment under the wheat and cattle subsidies be included, the corresponding figures are 122 and 121 respectively. The higher prices realized for the 1936 wheat crop represent a satisfactory feature, but against this there is no doubt that the average yield is seriously below the 1935 crop.

Agricultural policy in the main has been directed towards the further development of regulations covering production and marketing. The influence of national planning has been well illustrated in improved and more stable prices for potatoes brought about by the operation of the Potato Marketing Board. This has been reflected in an increased sale of fertilizers for this crop, particularly in the Fen Country, where little nitrogen has hitherto been used. As regards milk, the steadily increasing production, caused largely by the unprofitableness of the meat market, still continues. To meet this, some progress has been made in stimulating consumption, notably by the milk-in-schools scheme and by the establishment of milk bars throughout the country. Until the beef problem is solved, however, or some drastic steps taken with regard to the import of dairy produce, the present difficulties of the Milk Marketing Board are likely to persist. The Pigs and Bacon Boards were obliged to submit their difficulties to arbitration. The resulting award should do much to strengthen the position of orderly marketing. The Hops Marketing Board continues to give growers a profitable and assured market at the expense of restricted acreage. Considerable expansion has occurred in the production of glass-house crops and vegetables, flowers and nursery stock grown in the open. The home bulb-growing industry has also increased under protected conditions. The future of the sugar-beet crop, which absorbs large quantities of fertilizers, has been secured by the rejection of the Greene Report, which recommended the abolition of Government subsidies. A new short Act has been passed which controls acreages, coordinates the work of sugar-beet factories, and allows for the payment of subsidies sufficient to ensure the successful continuance of the industry.

Turning to domestic affairs, mention was made in the last report of the increases in staff employed in general propaganda work throughout the country. These increases coincided with a feeling of renewed confidence in the agricultural community and have enabled closer contact to be made with both farmers and merchants.

Considerable attention has been paid during the year to problems connected with the artificial drying of grass, as this development represents a new market for the use of all fertilizers, particularly nitrogenous fertilizers. Two farms, one in Cheshire and one in Co. Durham, have been taken over for the purpose of studying the technique of all operations connected with grass drying, and it is hoped that in time they will form useful demonstration centres, taking the place in some respects of Jealott's Hill, where it has been found necessary to shift the bias somewhat from fertilizer research to pest control. It will be within the knowledge of members that the problem of disease is hampering the further development of agricultural production, and therefore of the fertilizer market, and it is essential to keep pace with disease control measures if the full economic benefit of increased yields is to be obtained.

During the winter months a series of talking films was shown throughout the country, 261 shows being given to audiences totalling 20,027.

In Portugal demonstrations throughout the country continue to fix attention upon the need for nitrogen. In all overseas markets everything possible is being done to offset the effects of difficult exchanges, trade depression, and the consequent reluctance of farmers to buy.

The experimental and demonstration work which has been done on many crops in India, on rubber in Malaya, and on sugar in the West Indies is now bearing fruit. Support continues to be given to the practical study of fertilizing problems in many parts of the Empire, mainly by placing at the disposal of the investigators the fertilizers they need for their experiments.

Membership.

The list of members at June 30, 1936, recorded a total of 206 members, a reduction of 5 over that of the previous year, due to 3 amalgamations and 2 liquidations.

"The Black Book"*

A Directory of Solid Fuel-Burning Equipment

The ominous-sounding title—so reminiscent of our childhood days—belies the contents of this interesting newcomer to the ranks of commercial directories. Distributors and users of solid fuel burning appliances, whether industrial or domestic, will welcome the appearance of *The Black Book*, a directory of coal and coke consuming apparatus and associated equipment.

With complete and classified lists of the various makes under headings both of types and of proprietary names, and full particulars of the numerous organizations representing all aspects of coal and appliance industries, this publication is the first to satisfy fully a long-felt want. Its 310 pages also contain technical articles on the production, utilization, and standardization of coal and—a novel feature—a "Who's Who" of the solid fuel and allied trades. In their Introduction, the compilers, The Combustion Appliance Makers' Association (Solid Fuel), state that "The time cannot be far distant when all the activities connected with the production and use of solid fuel in Great Britain will be closely co-ordinated," and they regard this volume as another step in that direction. It is undoubtedly sufficiently comprehensive to interest all sections of the industry. Its proprietary names list exceeds 2,570 items, and its list of makers' names and addresses exceeds 1,000; in the latter feature particulars of branches, capital, and directorate are given as well.

Captain H. F. C. Crookshank, M.P., Secretary for the Mines Department, has written a Foreword in which he commends the book as an aid to the more efficient use of solid fuel. An interesting section on the London and Counties Coke Association, its aims and objects, has been contributed by Mr. W. L. Boon, the General Manager, while the work of the Fuel Research Board in connection with the physical and chemical survey of the coalfields is reviewed by Dr. F. S. Sinnatt. Details are also included of the Institute of Fuel and its functions. Coke receives attention in the section devoted to the properties and uses of solid fuels.

**The Black Book.* A Directory of Solid Fuel-Burning Appliances and Associated Equipment; 310 pages. Compiled by the Combustion Appliance Makers' Association (Solid Fuel) and published by Morgan Bros. (Publishers), Ltd., 28, Essex Street, London, W.C. 2; 7s. 6d. Cloth bound, 10 in. by 7¼ in.

A SUMMARY OF
Recent Gas Legislation

by
J. GRAYSTON
(of the Lea Bridge District Gas Company)

The first sections of Mr. Grayston's Paper were devoted to earlier gas legislation and constituted a synopsis of the principal clauses of the following Acts: Gas-Works Clauses Act, 1847; Gas-Works Clauses Act, 1871; Sales of Gas Acts, 1859-1860; Metropolis Gas Acts, 1860-1861; and the Gas Regulation Act, 1920. Reference to these, it will be observed, was made by various speakers in the course of the discussion which followed.

From a Paper presented to members of the London and Southern District Junior Gas Association at a meeting held at the London School of Hygiene and Tropical Medicine on Friday, Dec. 18—the PRESIDENT (Mr. R. Summerson, of Luton) in the chair.

Gas Undertakings Act, 1929.

This is an Act to amend and further extend the powers of the 1920 Act, and contains important provisions, especially as regards financial powers. It considerably extends the powers and scope of authority of the Board of Trade.

By Section 1, the Board may, by Departmental order, increase the amount of share or loan capital authorized. For the first time in the history of gas legislation, this authority is given without direct Parliamentary sanction. The procedure is laid down in the Gas (Capital and Borrowing Powers) Rules, 1929.

Section 2 authorizes the borrowing on mortgage, or by the creation of debentures, up to an amount not exceeding one-half the paid-up share capital, and the effect of this section is to increase the borrowing powers of all undertakers. Section 3 amends the 1847 Act with regard to reserve funds and any private Acts with regard to special purposes funds, to the effect that these funds may now amount to one-tenth the total capital, including mortgages and debentures.

Section 4 contains an extension of powers of purchase and working up of residual products from outside sources. The powers are conferred on all undertakers and are additional to any powers conferred on individual undertakings by Special Act or Order.

Section 5 introduces a new principle into gas legislation, and gives the Board of Trade power to sanction a supply of gas outside the statutory limits of any company if the premises are not within a distance of 25 yd. of any main of the undertakers in whose area of supply it is situated. The undertaking affected must be a consenting party. The Gas (Bordering Premises) Rules, 1929, are applicable.

Section 6 further extends the principal Act by making compulsory for all undertakers supplying more than 20 million cu.ft. per annum to charge on a thermal basis, and an obligation is imposed on the Board of Trade to make an order. It should be noted that this applies only to statutory undertakers within the definition of the 1920 Act.

Section 7 further extends the powers for the Board of Trade to make Special Orders under the principal Act, authorizing extension of limits of supply into the area of another company which has failed to exercise the right to supply. Also for inserting provisions in Special Orders contained in any other Special Acts.

Gas Undertakings Act, 1932.

This is a further general Bill to supplement the principal Act of 1920.

Section 1 gives undertakers powers to invest in other companies, to lend money on mortgage, and to subscribe, acquire, hold, and dispose of shares in any company which:

(*a*) Carry on any process or operation of the same, or substantially the same, nature as the undertakers are authorized to carry on.

(*b*) Are engaged in developing processes or manufactures likely to improve the manufacture and distribution of gas, or the utilization of residual products.

The amount to be so invested is normally limited to one-twentieth of the authorized share and loan capital of the Company, but the Board of Trade can approve of this being raised to one-tenth. Local authorities and undertakings making less than 250 millions per annum have somewhat restricted powers. We have in recent years seen many manifestations of the powers conferred by this Section which, however, does not affect any special powers granted in private Acts or Orders.

Any profits arising from the sale of such holdings are to be regarded as premiums which may not be distributed as dividends.

This Act in itself is extremely short, but it is one which is likely to have very widespread effects on the administrative future of the Industry, and I recommend the detailed text of the Bill for your serious study.

Gas Undertakings Act, 1934.

This is the most recent general legislation to amend the law with respect to gas undertakings and one with which we must be most familiar. It radically alters the text of the principal Act and introduces several new principles into Gas Law.

The first group of Sections is arranged to deal with capital powers. Sections 1 and 2 authorize the issue by public subscription of share capital and debentures; under previous Acts or Orders undertakers were obliged to offer all shares by public auction or tender. The Board of Trade shall not authorize such sale unless they are satisfied that the proposed terms are the best obtainable. Similar powers to these have been given in many Private Acts recently, especially in regard to the sale of new capital to employees and consumers. Section 3 authorizes the payment of underwriting commission on issues of share capital without regard to brokerages already lawful.

Section 4 gives general powers to create redeemable preference stock and debentures within the authorized share capital. Special powers had been granted with this effect in many instances. This section carries many benefits which ease the burden of interest on undertakers.

Section 5 amends all previous enactments relating to renewal fund contributions and limitations. It permits a contribution up to ½% of the capital in any year, with a limit to the fund of 5% of the total paid-up capital, including premiums.

Sections 6, 7, and 8 enable undertakers to obtain certain special charging powers, and together with certain other statutory provisions, are dealt with at length because of their importance, in that Section of this Paper devoted to charges.

Section 9 compels the Board of Trade to serve notice on all non-statutory undertakings making more than 30 million cu.ft. per annum on Jan. 1, 1936, requiring them to apply for statutory powers. Rather modified provisions are extended to companies between 20 and 30 million cu.ft. per annum.

Section 10 imposes the usual purity and pressure standards on non-statutory undertakings making more than 20 million cu.ft. per annum who are not thermal unit undertakers.

Sections 12-16 deal with amendments to the principal Act in regard to the testing of gas. By virtue of Section 12 the office of Chief Gas Examiner is abolished as from Jan. 1, 1935, and any appeal now lies to the Board of Trade. Also as from Jan. 1, 1939, the office of Gas Referees is abolished and their functions shall be discharged by the Board of Trade, who shall prescribe the place, method, and frequency of testing; there are powers to retain three competent persons to advise on the methods of testing. Section 13 empowers local authorities or quarter sessions to appoint Gas Examiners to test the gas supplied within the area in accordance with the amended Section 5 of the principal Act. This section is more specific than the original clauses of the 1920 Act, which gave rise to many difficulties. Section 14 deals with the determination of average calorific values and the payments to be made when gas has been supplied at below the declared value; if the excess revenue accruing in this way is less than 0·2d. per therm it is to be paid into the gas fund; if it is in excess of 0·2d. per therm a credit is to be given to consumers; the section also prescribes a minimum of six tests before arriving at any average calorific value.

Section 17 is an important clause, facilitating closer co-operation between undertakers with regard to giving and taking bulk supplies, laying pipes outside the limits of sup-

ply, and making provision for joint use of plant, research establishments, &c. Any pipe laid for purposes of bulk supply ceases to be a main under the 1871 Act, and, so long as it is not tapped, people within 25 yd. are not entitled to a supply. However, the provisions of the 1847 Act regarding street works are made definitely applicable to such pipes.

Sections 18-26 confer a number of miscellaneous general powers previously only given in Special Acts, with which we ought to be familiar. By Section 18, all consumers are to give 24 hours' notice before quitting premises, otherwise they are responsible for gas consumed up to the next ordinary meter reading or up to the time of application for a supply by the incoming tenant. Section 19 allows refusal to supply a person who has previously quitted premises without paying for gas and meter rent; it is important to note that fittings or appliances do not come within this section. Section 20 enables undertakers who are entitled to cut off supply on account of default to do so by disconnecting the service at the meter and gives right of entry for this purpose; it also makes it a summary offence to reconnect this pipe; this Clause extends the powers given in the 1847-1871 Acts. Section 21 gives additional powers of entry for inspection of factories and unoccupied premises. Section 22 allows additional fittings to be supplied on prepayment installations at charges additional to those prepaid, where the fittings are of a special nature, not ordinarily provided. By virtue of Section 23 an erroneous meter is deemed to have been incorrect from the last occasion but one when the meter was read and credit must be given or surcharge made accordingly. Section 24 makes a general provision regarding standby supplies; a consumer who is connected up to the mains merely for this purpose is not entitled to receive a supply unless he agrees to make certain minimum payments. Section 25 enables the undertakers to compel consumers operating engines, compressors, high-pressure air, &c., to fix and maintain antifluctuators or back-pressure isolating valves, and gives powers of inspection to see that these provisions are carried out.

Section 27 is one granting general powers regarding provisions in leases preventing supply of gas. It shall not be lawful for any local authority to insert in any instrument for the sale or letting of premises a provision restricting the right of any occupier to take a supply of gas. (The Kettering Clause.)

Capital, Price, and Dividends.

It has been the practice of Parliament in return for the monopoly of supply granted, to exercise rigid control over finances in two ways:

(1) By limiting the amount of capital which can be raised for the purposes of the undertaking and prescribing the method by which it shall be raised.
(2) By limiting the dividends to be paid, the price to be charged for gas, and the amount which may be set aside as reserves.

All undertakers are authorized in their Special Acts to raise a limited amount of share or loan capital. Prior to the Gas Undertakings Act, 1929, this sanction could only be given by Parliament, but under this Act the Board of Trade can authorize any increase. Since 1877 Parliamentary Standing Orders have required all private Bills authorizing additional capital to contain a clause providing that all shares shall be offered by public auction or tender; Section 1 of the 1934 Act does away with this.

The manner in which the dividends, price of gas, and reserve funds are regulated varies according to whether they are maximum price, sliding-scale, or basic price companies.

The maximum price company is the oldest type, and the tendency is for them to change to one of the other two. They are operated under Sections 30-34 of the 1847 Act. First, these provide that the dividends in any year are not to exceed 10% excepting to make up deficiencies of previous years; additional capital of this type is usually limited to 7%. The Act or Order also provides that the price of gas shall not exceed a certain figure per therm or per 1,000 cu.ft.

This gives us our maximum price, maximum dividend companies. Section 31 provides that any excess earnings are to be invested in a reserve fund not to exceed one-tenth of the total paid-up capital. When all these liabilities are fully discharged, any surpluses are to be devoted to a reduction in price of gas (Section 35, 1847 Act). Modern trading conditions have rendered the complete application of these powers utterly obsolete. No company can competitively sell gas at the maximum authorized price to-day.

The sliding scale of price and dividend was first introduced in the Commercial Gas Company's Act of 1875 and has been widely adopted since. The principle of its operation is familiar; a certain selling price, known as the standard price, is fixed for gas and to correspond with this a certain standard payable dividend is fixed. If by good management the Company can sell gas below standard price, it is authorized to pay proportionate dividends above standard; and *vice versa* if price is in excess dividends must be reduced. A maximum price for gas is usually fixed and high prices operate against the dividend. In conjunction with this standard system the undertakers usually have authority to set up three funds:

(*a*) Reserve fund—out of undivided profits to be used for the payment of dividends in any year when the clear profit is insufficient to pay the authorized dividends. The fund is unlimited in amount.
(*b*) Special purposes fund—out of revenue to meet expenses by reason of circumstances which good management could not have prevented or expenses incurred in the replacement or removal of plant—limited to one-tenth of the paid-up capital, also yearly appropriation is usually limited to 1% of capital.
(*c*) Renewals fund—out of revenue to meet expenses, requisite for maintenance and renewals of plant, limited by 1934 Act to 5% of paid-up capital with yearly appropriation of ½%.

Sections 30-35 of the 1847 Act dealing with these funds do not apply to sliding-scale companies.

The basic price system for the regulation of dividends was introduced by the South Metropolitan Gas Company in 1920. The recent prominence attached to this system justifies its close examination. A basic selling price for gas is fixed, together with a basic dividend representing a fair return on invested capital. At the end of each half-year a calculation is made of what the revenue would have been if all the gas had been sold at the basic price. From this is deducted the actual gas revenue, and the difference represents the consumers' benefit through not paying full price the company were entitled to charge. Any balance at the credit of net revenue after providing for payment of the basic divjdend, not exceeding one-third of the consumers' benefit, is to be equally divided between stockholders and employees, thereby giving both an equal benefit and interest in any reduction in price of gas. The shareholders get their benefit in the payment of increased dividends or accumulation of increased reserves; the employees in such manner as the directors may determine.

The main advantage of the basic price system is that it provides for a minimum dividend. The fundamental objection is that gas sold at the lowest prices provides the highest dividend authorization. For example, if the proportion of gas sold by special contract is high the apparent consumers' benefit is great, and larger dividends are authorized in spite of the fact that this gas may have been sold at little or no profit. In other words, it is contended that dividends should be controlled not by the average price received from gas but by the highest price which is being charged to ordinary consumers. It is thought in certain quarters that this is the only adequate safeguard for all consumers. It remains to be seen what is the opinion of Parliament as we are to have a Select Committee to enquire into the basic price system.

Modern legislation has tended towards the basic price system and it has many adherents, owing to the comparative freedom in tariffs.

Charges.

In accordance with Section 13 of the 1847 Act, undertakers have authority to make contracts with a prospective customer, with price limited in some way by a maximum, or bound up with dividends in such a way that charging of prices other than standard reacted detrimentally on dividends. Undertakers are also thereby prevented from imposing a minimum charge. Apart from these considerations the Section gives undertakers complete discretion as to price and any other terms of contract such as load factor, minimum requirements, &c., mutually agreed upon.

At a later stage the consumer was given protection in Private Bills by an equality clause incorporating a proviso stating that all such contracts be alike in terms and amount to all consumers for a supply in like circumstances and for the same purposes. By Section 6 of the 1934 Act this is automatically extended to all undertakings. The phrase " like circumstances and for the same purposes " is of very wide construction and has never been clearly defined by Law. For example, two different trades may be using gas in identical circumstances as a gas supplying proposition, and yet two different rates may prevail; one is tempted to ask if this is strictly in keeping with the equality clause. I do not see that we can construe this clause to mean that every consumer must pay his " economic " price, because each one can produce perfectly sound economic arguments that his " circumstances " are different.

Section 6 of the 1934 Act introduces a fresh principle in charges known as the " published price." This is the price

at which the undertakers are prepared to supply any consumer entitled to a supply by virtue of Section 11 of the 1871 Act, excepting for standby purposes, and has to be published to the general body of consumers. This, then, becomes the price for every therm supplied otherwise than by special contract, and for the purposes of dividend calculation under any of the three systems, no account shall be taken of charges made by the undertakers under special contracts.

Having given the notice of the published price, undertakers are then at liberty to make special contracts with other consumers upon any agreed terms, but a consumer may always elect to be supplied at the published price. The powers under this Section are optional, and, where not adopted, charging powers remain unaltered.

There are, therefore, now open two broad methods of charge:

1. Under Acts prior to 1934.

(*a*) A nominal price or flat rate to all consumers not under contract, with or without cash and quantity discounts, with the nominal price governing dividends.

(*b*) A two-part or block rate of very limited application, because the highest rate controls dividends.

2. Under the 1934 Act.

(*a*) Flat rate at published price for all non-contract consumers with the published price controlling dividends.

(*b*) Any tariff method under contract observing the equality clause, again with published price controlling dividend.

Other Provisions.

Other enactments usually incorporated in Private Gas Acts are:

Companies Clauses Consolidation Act, 1845 (and amending Acts).
Companies Clauses Act, 1863 (and amending Acts).
Conspiracy and Protection of Property Act, 1875.
Land Clauses Consolidation Act, 1845 (and amending Acts).

These are outside the scope of this Paper as are innumerable others of direct importance to the Gas Industry, especially the Factory Acts, the Finance Acts, and the Rating and Valuation Acts.

Discussion.

The PRESIDENT (Mr. R. Summerson, Luton), in opening the discussion, remarked that he was himself to some extent responsible for the introduction of this subject to them. When he was considering the programme for the session, he had felt that it was about time they had a Paper on some aspect of the administration of gas undertakings, and when he had approached Mr. Grayston on the matter he had readily consented to give them a Paper. The actual subject had been left to him, with the result that he had now produced this admirable and timely summary of the law relating to gas undertakings. This subject, went on Mr. Summerson, was of the greatest importance, and he would like to re-echo a sentence in Mr. Grayston's opening paragraph, where he said: "Improvements both in the technique and salesmanship of the Gas Industry are valueless unless they are within the framework of the law." This subject was of particular interest at the present time in view of the fact that a Joint Parliamentary Committee had been set up with the following terms of reference—namely, "To inquire into the powers regulating charges possessed by the South Metropolitan Gas Company and other companies authorized to operate under a basic price and basic dividend; To consider whether adequate protection was afforded to the interests of the different classes of gas consumers under those powers; and To report what action, if any, was necessary." He might also remind them that this subject was in the Syllabus of The Institution of Gas Engineers for the Diploma in Gas Engineering (Manufacture), and questions asking candidates to summarize the principal Parliamentary Acts had appeared twice in the last six Papers. In conclusion, the President observed that he was sure all students would be grateful to Mr. Grayston for producing such a useful and readable summary of what was usually considered to be a very dry subject.

Mr. P. F. SCARTH (Gas Light and Coke), having congratulated Mr. Grayston on his method of presenting a Paper on a difficult and yet very important subject, observed that a Paper on Law did not lend itself to general discussion; rather would he prefer to listen to a discussion between lawyers on the interpretation of several Acts of Parliament. If Juniors were to try to apply what each of them interpreted to be the law relating to gas supply as laid down in the several general Acts and the Private Acts of Parliament governing gas undertakings, they would, he feared, get into difficulties. To emphasize what he meant he need only use Mr. Grayston's own expression at the conclusion of the Paper: "Having given you this synopsis of the law relating to gas undertakings, I hope you are not going to ask me to interpret it." Therefore, said Mr. Scarth, while agreeing that knowledge of their legal position was an advantage, they should always remember the old saying—"A little learning is a dangerous thing."

Owing to the pending Enquiry on the basic price principle which was to take place before a Joint Committee of both Houses of Parliament, any discussion on the basic price was, he feared, *sub judice*. It was very unfortunate for Mr. Grayston that his Paper was due to be read at that time, because, but for the fact he had just mentioned, it would have developed into a first-class debate on the merits or demerits of the three methods of charge and dividend regulation—maximum price and maximum dividend, standard price and sliding scale dividend, and basic price and basic dividend. He thought he could safely mention the reasons put forward by the South Metropolitan Gas Company when promoting their Bill in 1919. They must take their minds back to the conditions which prevailed immediately after the war and the position in which the South Metropolitan Company found themselves at that time. The cost of production of gas had advanced to such a figure that they were compelled to raise the price of gas in the second half of the year to 4s. 8d. per 1,000 cu.ft. The sliding scale system had broken down. Under their then existing sliding scale the permissible dividend payable by that Company, with gas at that price, would have been under 1½% but for the operation of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. In addition to the reduction of dividend almost to vanishing point, the co-partners of the Company had received no bonus since the year ended June, 1917. The Undertaking was also further embarrassed by the shortage of working capital. It was to correct the impossible conditions ruling at that time that the Company introduced their Bill to adjust the various interests concerned—of capital, of labour, and of relations with consumers—and to re-organize entirely the system under which the Undertaking was regulated under the sliding scale.

Need for Revision.

Mr. W. F. D. GARTON (South Metropolitan) observed that the law relating to gas undertakings was created in the first place when gas was a monopoly; gas was now no longer a monopoly, and the law therefore needed some revision to meet the changed conditions. A particular case concerned the consumer who could demand a supply of gas even if it was only for a single boiling ring, and in that connection the question of minimum charge was raised. It had some time ago been stated by Dr. Burgin that the Government were not going to commit political suicide by sanctioning a minimum charge for gas; there were so many slot consumers who would be up in arms immediately. Moreover, the policy of imposing a minimum charge was a debatable point because it was not wise to risk losing even the smallest consumer once capital had been sunk in the plant required to supply him. In the case of new business, on the other hand, the matter was more feasible; though that created the difficulty that what they did for new consumers they should do for old. The price for street lighting, continued Mr. Garton, was usually stated to be equal to the lowest price to private consumers; but in considering the question of tariffs, did Mr. Grayston think that the public lighting should be treated as the lowest price? Mr. Grayston had stated in connection with the introduction by the South Metropolitan Gas Company of the basic price system in 1920 that a shareholder's benefit was payable as increased dividends or accumulation of increased reserves, while the employees benefited in such a manner as the Directors might determine. Mr. Garton pointed out that in the South Metropolitan Company's Act it was stipulated that the benefit should be distributed to the employees as a bonus on their wages. In regard to the setting up of a central gas board to regulate the tariffs of the Industry, this might be a question on which Juniors might be required to bring their opinions to bear on one side or the other in the future.

Mr. J. R. GALE (North Middlesex) said he thought it was illegal to charge rent for a meter which had been proved to be inaccurate, though many gas undertakings did so. Could Mr. Grayston tell them whether a gas undertaking could get back from the consumer money stolen from a slot meter if it were proved that the consumer had not stolen it himself? It was, he believed, held in some quarters that the money in a slot meter belonged to the consumer until it was collected by the gas undertaking.

Rights of Mortgagees.

Mr. HADDLETON (Croydon) observed that in connection with the Gas-Works Clauses Act, 1871, the Author had referred to the rights of mortgagees to appoint a Receiver and wind up a Statutory Company in the event of failure to pay interest, &c., due on mortgages. He thought it was now general that companies could borrow money by the issue of debentures rather than by specific mortgages, so that it appeared that unless a company borrowed on mortgage there was no provision made for winding it up if it became insolvent. Under Section 3 of the Gas Undertakings Act, 1934, Mr. Grayston mentioned authorization of underwriting commission on issues of share capital without regard to the brokerages already lawful. Mr. Haddleton asked if he could take it from this that companies were already authorized to pay brokerage in respect of applications for capital. Referring to the fact that gas undertakings were not empowered to impose a minimum charge, he suggested that this might possibly be dealt with under Section 13 of the 1847 Act, which stated that undertakers might from time to time make contracts with any persons for the supplying with gas of any public or private buildings, &c. Would it not be possible to consider each separate contract with consumers as a special contract under this Clause? Under Section 6 of the 1847 Act, undertakings were

empowered to erect lamps in public thoroughfares. Mr. Haddleton did not suggest that they should do this at their own expense, but, should they wish to do so, did this mean that they could put up a gas lamp with a view to demonstrating, for instance, how much better it was than electricity? It seemed that the basic price system had a great deal to be said for it, and possibly the chief criticism of the sliding-scale system lay in the fact that if an undertaking worked so economically that it was in a position to give its gas away it would only be enabled to pay a dividend of 10% or 12%.

Mr. J. MALSBURY (Tottenham) expressed the hope that when the Joint Committee had completed their Enquiry they would know just where they did stand. Experience of Case Law led him to feel that the position should be made clear, for when a gas undertaking was brought into the Courts of Law at the instance of a private individual, in spite of the fairness of the Judge and jury he thought that there was always an unconscious tendency to favour the private individual on the grounds that he was opposing the vested interests of a corporation. Mr. Malsbury also raised the question of recovering damages from electrical traction undertakings in respect of corrosion caused in gas mains by the leakage of electrical currents. There was legislation which limited the amount of leakage which was permitted from electrical mains, and he knew of an instance where a gas main was riddled with holes for a distance of a hundred yards and more from this cause; this case had actually been settled in the gas undertaking's favour without coming into the Courts. In regard to the theft of money from slot meters through no fault of the consumer, the usual contract made the latter liable for the amount of money in the meter.

Mr. S. C. WALDOCK (Gas Light and Coke) remarked that a great deal depended upon the contract signed by prepayment consumers. His own Company, for instance, did not use contracts for the majority of their prepayment consumers. He enquired what was the legal position if no contract had been signed; also, if one was signed, should it bear a stamp? This was a rather important matter.

"The Smell of Coal Gas."

Mr. F. C. SMITH (Gas Light and Coke) referred to the Clause in the Gas Regulation Act of 1920 which required undertakings to supply only gas which smelt of coal gas. What, asked Mr. Smith, was the smell of coal gas, and if certain purification processes or the addition of mercaptans were employed, which would have the effect of altering the smell, would this be illegal?

Mr. F. O. HAWES (Tottenham) referred to Section 13 of the Gas Undertakings Act, 1934, which empowered local authorities or Quarter Sessions to appoint Gas Examiners to test the gas supplied within the area in accordance with the amended Section 5 of the principal Act, which Mr. Grayston had stated to be more specific than the original clauses of the 1920 Act which gave rise to many difficulties. Mr. Hawes observed that they had not found this to be the case. In their own area they had at least two testing stations, and the Examiners reported the average of their tests each quarter to the Middlesex County Authority, and everybody was satisfied. But under the new Act Middlesex was no longer a local authority, and consequently each of their Examiners had now to report separately. Therefore, in the unlikely event of one of their stations sending out gas of the wrong quality, how could the Board of Trade decide which body of consumers should benefit under the penalty which could be imposed?

Mr. H. W. H. BUTTERFIELD (South Suburban) said that under Section 5 of the Gas-Works Clauses Act of 1871, in reference to lands to be used for gas-works purposes, the promoters had to serve notice upon every owner and occupier of premises situated within 300 yards of the limits of the site. Mr. Butterfield pointed out, however, that unless the owner of property was *resident* within the 300-yard limit one need not notify him.

Mr. N. CALVERT (Tottenham) asked if an undertaking could place consumers on different contracts.

The PRESIDENT referred to Section 1 of the Gas Undertakings Act, 1929, which empowered the Board of Trade, by Departmental Order, to increase the amount of share or loan capital authorized, this authority, for the first time in the history of gas legislation, being given without direct Parliamentary sanction. Mr. Summerson questioned whether it was wise to give a Government Department powers to execute such orders without Parliamentary restriction.

The Author's Reply.

Mr. GRAYSTON, replying to the discussion, emphasized that it was part of the duties of each one of them to interpret the law in the course of their everyday work, and they could not ignore this responsibility. Every time they made contact with their consumers and every time they walked across their works yard they were called upon to interpret the law; so the more they knew about the subject the better. The Gas Industry was agreed that the 1934 Act did not go far enough. They had great hopes of it and were bitterly disappointed that it disregarded any rights to impose a minimum charge. But they must keep on trying, and they looked to the National organizations to continue the fight by pointing out how by the extension of their legal powers they could bring benefits to the whole body of gas consumers. In regard to public lighting contracts, his remarks embodied the actual words of the Act that due regard must be paid to the price of gas to ordinary consumer. If they did not attempt to sell gas for public lighting at a price which prejudiced the ordinary consumer they had a perfectly free hand. He was aware that the 1920 Act of the South Metropolitan Gas Company made the employees benefit from the basic price system payable in the form of a bonus to the employees, but in the majority of cases wide discretionary powers were left to the Directors. Mention had been made of the extensive powers of the Board of Trade, and several members of the Gas Industry had already objected to this; Dr. Carpenter had not long ago written a very strong letter to *The Times* protesting against the abolition of the Gas Referees. He could not agree with Mr. Gale's suggestion that rent for inaccurate meters was not chargeable; he did not consider that this would be sound law. Such methods were, of course, employed by certain undertakings with a view to maintaining the goodwill of their consumers. In regard to robberies from slot meters, it was invariably agreed that the consumer was liable for the cost of the gas he had consumed, and if the money was removed from the meter by a third party the consumer was still responsible to the gas undertaking for the gas used.

He was glad Mr. Haddleton had emphasized the difference between mortgagees and debenture holders. Many companies had raised capital by mortgage, but it was not usual in the Metropolitan area, and the law did not give the same protection to debenture holders. Payment of underwriting commission was provided for in general legislation and was the procedure generally adopted. Mr. Haddleton had also raised the question of incorporating a minimum charge under the heading of special contracts to individual consumers; but Mr. Grayston did not think this was permissible in law, as it would violate the equality clause. They could not have persons living three miles from the gas-works claiming different circumstances from those living a hundred yards away; the law did not expect a consumer to pay for the cost of supplying gas. The voluntary erection of lamps in public thoroughfares was always dependent upon the sanction of the local lighting authority. An undertaking must always obtain the permission of this body before they could make the gratuitous donation of a lamp. Mr. Haddleton had quoted figures in reference to the operation of the sliding scale if they were so efficient as to be in a position to give their gas away. Mr. Grayston did not know what the standard dividend was at Croydon, but he thought that if they were to give their gas away they would have to pay a fabulous dividend.

He agreed with Mr. Malsbury that there might be a tendency to "down" the vested interests in favour of the private plaintiff; this was just a matter of human psychology. It was a fact that the powers given to traction undertakings limited the amount of leakage of electrical current, but it was a very difficult matter for a gas undertaking to prove that excess leakage had taken place and even more difficult to prove the magnitude of that leakage. In glaring cases the traction company would usually admit liability.

Stamping of Prepayment Agreements.

In reply to Mr. Waldock, Mr. Grayston observed that he was not aware of many undertakings which stamped the ordinary prepayment agreement; he did not think that any Court of Law would require such agreements to be stamped before having legal effect. It was news to him that the Gas Light and Coke Company did not make agreements with their slot consumers. Special powers incorporated in Private Bills gave that Undertaking a stronger position than general legislation, but it was necessary for the majority of companies to establish their legal status by having signed agreements with their prepayment consumers. With regard to Mr. Smith's observations, Mr. Grayston remarked that if Mr. Smith wanted to produce some hypothetical gas by tincturing it with mercaptans it was for the Board of Trade to decide whether it smelt of coal gas. The 1934 Act provided for local authorities to appoint gas examiners, and the initiative rested with the local authority; the gas undertaking could not request them to do so—much less insist upon it. In regard to the point raised by Mr. Butterfield, he emphasized that only private dwelling houses were affected by the clause requiring notice to be given in connection with land for gas-works purposes; but local by-laws were applicable to gas undertakings even so far as scheduled lands were concerned. He instanced a case in which it was desired to utilize certain scheduled land for the erection of purifiers, but the local authority had scheduled that piece of land for road-widening purposes, and even though the gas company had Parliamentary powers to use the land for gas-works purposes they had to comply with the local by-laws.

Whether it was desirable or not for the Board of Trade to be empowered to make departmental orders without the sanction of Parliament he would not like to say. Parliamentary time was so congested with matters of major National importance that it became necessary to delegate certain powers to individual departments. The fact remained that departmental orders could be given by the Board of Trade which did not require Parliamentary sanction—and that was where a departmental order differed from a special or provisional order. A departmental order could be approved and given immediate effect, while the other two had to lie on the table of the House and be embodied in an Act before they had the effect of law.

Vote of Thanks.

A hearty vote of thanks to Mr. Grayston was proposed by Mr. WALDOCK, who observed that they were greatly indebted to the Author for spending so much time and trouble in setting out all this valuable information. He considered that it was time the Gas Industry had a Consolidating Act to simplify the whole position. The vote was seconded by Mr. SCARTH, who said that the Paper would be very valuable for reference when they came up against difficulties in regard to gas law. The vote of thanks was cordially passed, and Mr. GRAYSTON briefly responded.

PROBLEMS WHICH CONFRONT
The Industrial Gas Engineer

by
F. BELL
(of the Liverpool Industrial Gas Centre)

From a Paper read before members of the Manchester and District Junior Gas Association at a meeting held at Liverpool on Dec. 9—the PRESIDENT (Mr. T. Caldwell, of Widnes) in the Chair.

During recent years my own Company, in common with many other undertakings, has offered a reduced tariff for gas as used for central heating, under pressure hot water boilers, and steam boilers. This reduction, in conjunction with the improvement in design and operation of gas-fired boilers, has enabled us to enter into competition with fuels which previously have had the monopoly of these important operations.

We were recently approached by the management of a laundry with a view to converting their cross tube steam boiler. Not being enthusiastic about the conversion of such a boiler, we proposed the installation of a new Cochran "Sinuflo" gas-fired boiler. The boiler chosen was the 6C size, capable of evaporating 650 lb. of steam from and at 212° F. It was fitted with injection feed, and provision was made for the fitting of automatic feed pump at a later date. The automatic pressure control which we fitted to this boiler was of the Thorpe type, which combines the "detector" and "valve" in one unit.

The running costs of the new boiler have been compared for a month of this year with one month of last year when the work carried out during the two periods was similar. Last year on coke 11 tons were consumed during the month; this year, for a similar working period, 1,135 therms of gas were consumed. This gives a figure of 103·2 therms of gas being consumed per equivalent ton of coke used in the other boiler.

On our scale of charges for this class of work our consumer will pay 4·3d. per therm, making his total cost for gas per equivalent ton of coke as £1 17s. The prevailing price for coke in Liverpool delivered in quantities as required by a firm of this size was £1 10s. The advantages and savings obtained by using the gas-fired boiler are enumerated below, and in this case were considered to outweigh the additional expense in fuel costs.

(1) No dirt or dust from ashes or coke, which was previously blown into the laundry and deposited on finished goods. No complaints from neighbours or Smoke Inspector about dust and smoke from chimney.
(2) Coke storage space now available for other storage purposes.
(3) Boiler up to working pressure in 35 mins. each morning. Coke boiler necessitated a boiler man being present 1½ hours before the other operatives so as to have the boiler at working pressure when required.
(4) Working pressure constantly maintained. This is important for the operation of the ironing calenders.
(5) The only labour required by the gas boiler is for operating the feed water injector.
(6) Constant supply of a constant quality fuel. This is important in view of the condition of the coke market at the present time.

Now let us consider steam generated in a central boiler plant, as used for food cooking. In the Gas Industry we have previously considered food cooking in the terms of individual steamer or boiler units, gas heated. But you will appreciate that for large installations a central boiler supplies steam for steamers, boiler pans, hot cupboards, and hot water supply has its advantages. For such boilers solid fuel has previously been extensively used, but with the introduction of automatically controlled reliable gas-fired steam boilers, coupled with low gas tariffs, this should no longer be the case. Just recently I have had the pleasure of working on three installations when gas-fired steam boilers have been supplied.

One steam boiling pan installation was for the preparation of fruit syrup previous to distribution to the trade. The fruit cells (grape fruit, orange, &c.) which come to this country in casks are crushed between special rollers and the resulting product is heated together with white sugar to a temperature of 180° F. in the steam-heated pans. These pans are of rustless cast iron lined with acid-resisting vitreous enamel. After standing for 30 min. the syrup is run into cooling tanks and from there to large glass vessels for distribution. The gas-fired steam boiler in this case was supplied by the Constructional Engineering Company and takes one hour to reach 40 lb. per sq.in. from cold. One batch of syrup consists of 14 gall. of fruit juice and 2 cwt. of sugar and is raised to 180° F. in approximately 20 min. The condensed water in each pan is run into a common return main which flows back to the feed water tank.

The Milk Industry.

As the activities of the Milk Marketing Board and the Licensing Authorities of the Ministry of Health become more pronounced, so should the activities of the industrial gas salesman. We in our district have supplied and fitted, or converted to gas firing, numerous steam boilers for pasteurizing milk, sterilizing bottles and utensils, and providing hot water for washing operations.

For the dairyman who does not require steam for hot water but does require a satisfactory sterilizer for bottles and cans, we have a self-contained gas-heated unit consisting of chest and stool designed by the Liverpool Gas Company. The chests are made in two sizes, to hold 200 and 320 pint bottles respectively, and are fitted with tight fitting hinged doors. A steam connection for the steaming stool is taken from the chest and leads *via* a brazed brass pipe through the products space to a valve on the side of the chest. These chests enable a dairyman to sterilize thoroughly a chest full of bottles and a number of cans in less than 35 min., starting with a cold chest, for a consumption of about 90 cu.ft. of gas. These appliances can be fitted under cover inside the dairy wash-house. They are free from dirt, entail the minimum of attention and labour, are cheap to install, and economical to operate. It is gratifying to know that our activities in these directions have the full approval of many of the Medical Officers of Health, who see that our appliances are an assistance to them in their campaign for cleaner milk and a higher standard of hygiene.

Snuff Manufacture.

It was during a visit to a firm of tobacco manufacturers that our industrial representative happened to notice the method they employed of toasting the tobacco stem. A large drum containing the stem was carried in rough bearings above a coke fire 5 ft. by 2 ft. 6 in. and rotated by hand. Owing to lack of control of this fire the drum had often to be hastily removed to avoid overheating of the stem. This method resulted in an unevenly treated product, was cumbersome, hot and arduous for the men, and the tobacco dust falling from the drum was lost in the fire. After each series of toasts the grate had to be cleaned out and the ash and cinders removed. To toast 150 lb. of stem in this way required 1 cwt. of coke, costing 1s. 6d., *plus* labour necessary for the making and refuelling of the fire.

Our offer to toast a sample of stem in a drum heated by gas was reluctantly accepted, since the coke fire method had always been the standard for snuff preparation. However, the stem toasted by us was submitted to the firm's expert, who reported a more satisfactory and evenly toasted product than could be obtained with his own method. An order was taken for a drum and necessary equipment capable of toasting 25 lb. of stem at a time. The plant has been installed and is producing from the tobacco stems a fine "silky" powder to the entire satisfaction of the firm. The 25 lb. are toasted in 15 min. with the gas full on at 144 cu.ft. per hr. Now 150 lb. are toasted for a gas

consumption of 216 cu.ft. at a cost of 7½d. as against his previous fuel cost alone of 1s. 6d.

It would possibly be wise to say at this stage how very important we consider these periodic visits to our industrial consumers. In general, the principals of the firms appreciate the visits of our representatives, as it gives them opportunities to raise any heating problem which they happen to have in mind. On other occasions, too, the representative is often invited to inspect the works of a consumer, and it is then that opportunities must not be missed to spot places where gas can be successfully introduced in place of other fuels. Consumptions obtained in this way are real gains and may never have been realized had it not been for the visit and the discernment of a trained industrial representative.

It was during these visits to foundries in Liverpool that we noted that foundry cupola fires were generally lighted by paper, oily rags, and wood, or by under-pressure paraffin burners. Wood bought at 9s. to 10s. per ton has to be broken and prepared, the total cost of lighting a fire thus approaching 2s. With paraffin the operation is much quicker, but at least ½ gall. of fuel is used at a cost of 8½d. per gallon.

Lighting by gas was proposed. A gas and air blast burner, consisting of a gas-air mixer and cast iron nozzle, was made up. This burner consumed 400 cu.ft. of gas per hour and the cupola fire was burning most satisfactorily after 10 min. use—*i.e.*, with about 70 cu.ft. of gas. The method was therefore cheaper and quicker, and has now been adopted by a number of foundries.

Metal Melting by Duoflam Burners.

During the past year or so a burner of unusual interest has been introduced into this country and is applicable to many industrial operations. The burner to which I refer is the Duoflam. The burner jets are built up on a cast iron manifold, and each pair of jets is set in the same plane, a little distance apart but at right-angles to each other. Each pair of jets therefore produce one flame which has a relatively small volume. Thus with a series of these jets made up into a burner a large quantity of heat can be developed in a confined space. They need no adjustment and have a turn down range of 95%; they are particularly suitable for thermostatic control. They have been adopted with success to the conversion of solid fuel sectional boilers as used for central heating. The burners were used successfully to convert to gas firing a 15 cwt. electro-type metal melting pot, previously coke fired.

Immersion Heaters for Soft Metal Melting.

The desirable points of the immersion system of gas heating are not new to us in the sphere of industrial gas utilization, but the application to soft metal melting has produced difficulties in burner design. Let us consider the advantages to be obtained by a successful method of immersion heating.

(1) The heat generated is liberated in a relatively small chamber (as against an externally heated pot) and is entirely surrounded by the metal being heated. The heat transfer is rapid and consequently promotes thermal efficiency.
(2) The insulation for the pot is not in contact with the hot gases, so it never exceeds the temperature of the contents. Insulation can therefore be made more effective. Radiation losses are reduced to a minimum, and low load operation costs are also low since there is no air passing through the heater and extracting heat as does happen through the furnace of an externally heated pot.
(3) Heat recovery is rapid and low turn down is possible when the pot is idling. Temperature control is therefore most accurate; generally in the region of *plus* or *minus* 5° F.
(4) Overheating of the metal or exposure to air can be considerably minimized by the immersion system. Dross formation is therefore reduced to a minimum.
(5) The life of the container is longer than one externally fired.

Realizing these advantages, an American firm has made a special study of the system, and during recent years has developed and produced a successful plant. We in Liverpool have just installed in a works one of the first of these plants to be worked in this country. The Gas Light and Coke Company has, however, an experimental 5-ton lead pot at Watson House. In our case the system has replaced an externally gas-heated furnace. The claims of the makers are that a reduction of 35 to 40% in gas consumption will be effected by a complete plant using this system.

Discussion.

The PRESIDENT (Mr. T. Caldwell) asked Mr. Bell to give his opinion in regard to the manner in which industrial problems should be tackled. Widnes contributed to the Industrial Centre. In his opinion, the only way to get the industrial load was to have specially trained men to investigate the problems of the consumers, and then to put them through to the Industrial Centre if any great progress was to be made. Birkenhead appointed an industrial man and the industrial load increased by 20%. In his view the full benefit of the Centre was not obtained unless the undertaking had a man to seek the load in the first instance. Price must also be considered.

Mr. H. P. LUPTON (Liverpool) said that in Liverpool a fairly large engineering contractor was convinced that gas could not compete in price with coke for the annealing of chains. Eventually it was arranged that a length of chain should be divided —one portion being annealed on the coke hearth and the other sent to the Industrial Centre. The contractor agreed that the gas fired chain was superior to that annealed on the coke hearth and promised to look further into the matter. He was now a large user of gas at the ordinary industrial rates for Liverpool gas—viz., 7·6d. per therm for the first 475 therms, and 6·6d. per therm for the next 525 therms. The cost was finally halved by using gas in place of coke, at an average cost of about 6½d. per therm. A company had recently stated that rivets from a gas heated furnace were superior to those from a coke fired furnace, and they were so convinced that they put in five gas heated furnaces. This necessitated a 5-in. main being laid to the works.

Mr. R. L. GREAVES (Stockport) proposed a vote of thanks to the Author of the Paper. He had noted the remarks of Mr. Bell in regard to sterilizers for dairymen. So far as he was aware, no Centre had interested itself in the hot air sterilizer. The Medical Officer of Health would not object to that type of sterilizer, and it was to the Industrial Centres that they looked for research work on this and other questions. He agreed with the Author that, particularly in small factories, heating methods were generally extraordinarily crude. Here was a big field for the industrial man of personality and experience.

Mr. J. GRAHAM (Lancaster) seconded the vote of thanks. He remarked that many of the problems arising in the Gas Industry could not be solved by text books, and it was from Paper such as this that solutions could be found.

Mr. BELL thanked the members for their vote. In reply to the point raised by Mr. Greaves in regard to the sterilizer, he said that the Centres must put forward something which they knew the Medical Officer would be prepared to accept; torch sterilizing did not seem to be popular.

Hot Water Service*

A Book for the Heating Engineer

The use of gas and coke for the provision of domestic and industrial hot water supplies and for central heating is growing apace, and a knowledge of the heat requirements of different systems, and how to estimate for various demands, is becoming of more and more importance to those connected with the sale of gas. "Hot Water Service," by Sidney F. Greenland, is a book obviously written for the heating engineer, but it contains a great deal of the type of information which the gas salesman needs. It describes, in comparatively small compass, the design and lay-out of hot water systems and includes many tables giving in useful form the detail concerning pipe sizing, heat losses, and so on, which it is desirable that those who are tackling installation work should have at hand. The Author's treatment is straightforward and practical, and the calculations of typical examples which he sets out—and they cover a wide range—should prove most helpful in arriving at an understanding of how to approach this class of admittedly specialized work. Faulty fitting, due to lack of appreciation of hot water flow principles, can ruin any installation the component parts of which may be correctly chosen. This book correlates theory and practice in a clear way.

There are seven chapters to the book, which is well illustrated with line diagrams. The first chapter deals with water composition and characteristics, and with the effects of temperature and pressure. The next chapter describes the various systems—tank, cylinder, combined cylinder and tank, indirect and calorifier, accelerated, and those with low level returns. Chapter 3 is concerned with estimating hot water consumption; Chapter 4 with pipe sizing principles and calculations, and practical examples are given in the chapter which follows. Chapter 6 sets out simplified methods of approximate pipe sizing, while the final chapter deals briefly with boilers, flues, storage vessels, pumps, fuel consumption, and regulations. In regard to this chapter, only a few lines are devoted to "estimates of fuel consumption." The Author considers solid fuel only and assumes a boiler efficiency of 80%.

* "Hot Water Service; Design and Pipe Sizing," by Sidney F. Greenland. Published by C. A. Philpot, Ltd., Vulcan House, 56, Ludgate Hill, E.C. 4; price, 12s. 6d.

Scurf Formation in Continuous Vertical Retorts

by
J. A. DERBYSHIRE
of Shipley

From a Paper read before members of the Yorkshire Junior Gas Association at a meeting held at Barnsley on Dec. 12—Mr. J. RICHMOND, of York (Senior Vice-President), presiding in the unavoidable absence of the President.

Our carbonizing plant at Shipley comprises a battery setting containing twelve 62-in. downwardly-heated continuous vertical retorts of the Woodall-Duckham standard design having an individual throughput per retort of 6·24 tons per diem, or a collective throughput of 74 tons per day. Our carbonizing temperatures are between 1,330°-1,350° C. on the top sighting brick, and 1,180°-1,200° C. at the check tile level, this bottom temperature being quite suitable for limited steaming.

With the upwardly heated retort, heat zoning in any particular region of the retort can very easily and more expeditiously be carried out, but since a lower chimney or fan pull is necessary it is essential that it remains constant, otherwise any slight increase may cause a 30° or 40° C. rise in various combustion chambers. Another virtue of this system is that high bottom temperatures are easily obtained, thus giving a good water gas reaction, with increased steam decomposition, a factor of importance in the manufacture of lower grade gases. With the upward system less spalling is claimed than with the downward. Possibly this may be correct, but the fact remains that spalling can be accentuated in either system if the elimination of the scurf is not carefully carried out. Another advantage claimed is better coal travel, due to the coal being gradually heated, with also gradual swelling. This gives a greater choice of coals, possibly at a lower price, including slacks.

It has also been stated that larger working periods or cycles with less scurf formation takes place with the above system, but my own experiences convince me that it is the classes of coals and the operating conditions existing on any plant, whether upwardly or downwardly heated, which determine long or short working cycles with more or less scurf formation. For two independent installations, and where blending is not practised, the downward system is quite suitable when making high grade gas from medium and non-swelling coal, carrying high temperatures at the top with moderate bottom temperatures. The upwardly heated system is suitable for higher swelling coals and coals which give off their volatile matter freely—a characteristic of, say, a good South Yorkshire coal—and where the temperature gradient is from fairly high temperatures at the bottom to high temperatures in the centre, and moderately low temperatures at the top. This fairly high bottom temperature is conducive to good steaming efficiency for calorific values of 450 B.Th.U. gross or under. At the present time, however, we are commanding a good price for our coke, and it looks very much as though in the future further increased prices will be realized, and, of course, as the price of coke increases, steaming the retorts becomes less attractive.

Various investigations on the flaking or spalling of vertical retorts seem to prove that scurf elimination from the retort walls is the contributory factor due to high localized temperatures, temperature fluctuations, or the action of the ash in the scurf fluxing with the retort material. Some proof of this is that when small carbon plates are dislodged *in situ* from the retort and examined no sign of any spalling is apparent. Scurf is the chief cause of wear and tear which takes place on the retort refractory for, say, the first 12 ft. down. If the period between scurfing can be increased while maintaining efficient working, the life of a retort will be greater. We have experimented with varying scurfing cycles, the length of period between scurfings being from 6 to 12½ weeks, and we have had no trouble whatever from hanging up charges or difficult rodding. After a 12½ weeks' period, the retorts have been scurfed, and we have been surprised at the small thickness of scurf formed and its different structure throughout its length. Great care, however, must be exercised in the removal of scurf, whether the cycle is 4 weeks or 10 weeks, and it is essential that slow scurfing should be carried out. Having ample plant available, the time taken for scurf removal varies between 66 to 72 hr.

The temperatures of the retort are reduced to approximately 1,230° C. at the sight brick, and 900° C. at check tile level, and when the retort is empty a cover is placed on the top mouthpiece carrying an inclined vent. For the first 24 hr. the bottom middle poking hole only is available, and during the next two subsequent 24 hr. the other two outside poking holes are then opened. From our experiences we have found that when de-scurfing after a long period and adopting the above procedure, the thickness of the carbon is gradually reduced and larger quantities of incandescent particles of carbon fall down to the bottom of the retort. With quicker scurfing and high local temperatures, considerably thicker carbon plates may be detached from the brickwork, bringing with them part of the refractory. As soon as the retort is scurfed, additional heat is added so as to prevent any drop in temperature of the retort which naturally occurs after scurfing.

We have gradually increased our scurfing periods up to a maximum of 12½ weeks (88 days), but we have one retort at the present time which has been working for 16 weeks and is giving no trouble whatsoever, taking its quota of coal each hour and requiring a minimum amount of rodding. We are working this retort to the maximum limit.

Visual Examination of Scurf.

After 88 days' work a retort which has had a life of 6½ years was let down, and we found, as we have also noticed on other retorts running long scurfing periods, that when the retort was emptied the whole area of the scurf, on both the major and minor axes, was remarkably smooth, but after the first 6 hr. of admitting air through one poking hole, cracks occurred in the scurf on the major axes only, in a region 5 ft. to 10 ft. down the retort. After scurfing,

Fig. 1.—Scurf as produced at the present time at Shipley.

NOTE.—(*a*) Close-grained structure at base; (*b*) needle shape or stallactite formation; and (*c*) flexible and pasty top portion with cavities.

the detached pieces were examined and found to be absolutely free from spalling, the weight of the carbon plates only aggregating 103 lb. A remarkable fact is that when a retort under the same operating conditions and throughput has been down for scurfing after only 8 weeks' work, and strictly adhering to the stipulated scurfing procedure, the total weight of the scurf has increased to 147 lb. Upon careful examination of the carbon after scurfing we have noticed a great change in its structure, these being in three distinct physical formations.

Fig. 1 illustrates the structure of the scurf and reveals three interesting points: (*a*) The closer grained structure at the base, (*b*) the needle shape or stallactite formation, (*c*) the flexible and pasty top portion with cavities the surface of which is remarkably smooth. These needles, when viewed under the microscope in reflected light, exhibit a series of very small circular globules. When a small piece taken from inside a cavity was re-viewed under the micro-

scope and compared with pitch coke a striking resemblance was noticed in the form of wavy lines, indicating possibly that liquid flow to a small degree has taken place. This form of scurf is light in weight and existed at a depth of approximately 2 ft. 6 in. from the top of the retort.

The left hand side of the photograph (fig. 2) illustrates the same phenomena to a less degree, the thickness of the scurf being considerably reduced, the region of its adhesion being approximately half way down the retort.

The right-hand side of the photograph (fig. 2) shows a different structure altogether, the scurf being built up of a series of laminations, the planes being very easily seen with the naked eye. The section is very smooth on top, close grained, and denser. This was situated inside the retort mid-way between the other two types previously described.

It is generally accepted that after scurfing the scurf assumes a curved form, but very few of us would imagine it to become pasty and in that state solidify. Either the structure of the scurf in the retort when working for a long period has undergone a change, possibly due to the pressure conditions existing, and when a retort is emptied for scurfing, the scurfing process causes this interesting phenomenon, or, as an alternative, it may be caused while a retort is working, but only when it has been in operation on a long cycle. It seems that when the scurf is deposited on the retort face it is not pure carbon or graphite, but probably a high ratio carbon-hydrogen compound, and the differential temperature between the retort wall and the scurf, combined with pressure, alters its molecular structure, forming cavities in which distillation of tarry

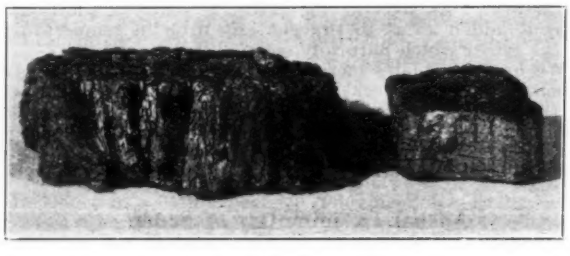


Fig. 2.

vapours takes place, and leaving a small residue somewhat resembling pitch coke. Incidentally this type of scurf has not by any means the same degree of curvation as the orthodox type of scurf we are all accustomed to seeing, and this factor may play a prominent part in its non-spalling properties.

We are still pursuing our investigations on this interesting and important problem, and it has been decided that three of our retorts, which have had a life of 6½ years, shall have at least another 12 months' work. Our make per ton is being maintained and we consider that we are working efficiently with longer periods between scurfing when making a 500 B.Th.U. (gross) gas. We are, however, experimenting with longer scurfing periods at higher than nominal throughput, and up to the time of preparing this Paper a retort has been in commission 71 days at this higher throughput, with exceptionally even and regular coal travel, without any trouble whatever.

Advantages of Increased Scurfing Cycles.

The advantages of working longer periods between scurfing are:

(1) Increased life of refractory.
(2) Reduced loss of gas.
(3) Reduction in labour.
(4) Lower fuel consumption.

From our experiences the factors influencing scurf structure are:

(1) Pressure working, combined with suitable coals for carbonizing, facilitates rodding, lubricates the top sections of the retort, promotes easy coal travel, and makes possible increased periods between scurfing. The scurf face is much smoother. On the other hand, by regulating the C.V. by vacuum, we obtain the opposite. The face of the scurf is blistered and uneven, and the need for scurfing is more frequent.

(2) The carbon formed is of different structure in various zones of the retort, and it is reasonable to assume that the scurf varies with temperature gradients and operating conditions—namely, vacuum, level gauge, and pressure working.

(3) Constant conditions of plant control, such as temperatures, throughput, and steaming, combined with constant governing after slight adjustments, appear to alter the type of scurf and its adhesion to the retort walls. It is visualized that the scurf structure and, more important, its adhesion vary in different plants.

It is important that determinations of the volatile matter in coke should be carried out periodically when retorts are working long periods between scurfing. Samples of coke from various discharges after 110 days' working approximated to within the limits of 1·15% and 1·35% volatile matter, which we regard as being satisfactory.

I should like to express my thanks to my Chief, Mr. H. Burton, for his interest and encouragement, to Mr. L. R. Cowley for his co-operation, and to the Woodall-Duckham Company for their courtesy in the preparation of the accompanying photographs.

Discussion.

Mr. L. R. Cowley (Shipley), who collaborated with the Author in the preparation of the Paper, said the subject of the structure and formation of scurf had not received sufficient attention. Visually there was a distinct difference in the structure of the two forms of scurf produced under vacuum and under pressure conditions. Micro-photographs showed that this persisted even at high magnification. In viewing specimens he had been struck by certain points in the pressure-formed type which led him to consider the possibilities of liquid flow during the formation of the scurf. Similarities with pitch coke lent strength to this assumption. To find whether the scurf had much effect on coal travel, two retorts which had been in continuous operation for ten weeks were allowed to work as long as they would without rodding. The coal flow in these retorts continued uninterruptedly for periods of 37 and 51 hours, with hourly inspections, without the need of any rodding whatever. The remarkable fact which emerged was that during this period of no rodding the coal travel was more regular than was normally the case, as shown by the other adjacent retorts which religiously received hourly rodding whether they needed it or not. The stokers reported that rodding merely meant, under these conditions, putting the rod in the hole, when its own weight carried it through the plastic layer. No force was necessary. Although the regular hourly rodding was a safeguard, he felt that the frequency of this operation could be diminished safely.

Mr. A. W. Elliott (Elland) remarked that while under pressure conditions probably more tar vapours became cracked and there was a higher yield of hydrocarbons in gaseous form, he could not agree with all Mr. Derbyshire had said in regard to the throughput. Could the Author tell the meeting whether an an increase in fuel consumption had been observed?

Mr. V. J. J. Siddons (Barnsley) said it seemed to him that what Mr. Derbyshire had reported differed from usual experience. Pressure control gave a fine limit of control, and perhaps that explained the divergence. The thermal yield appeared to be very different from general experience.

Mr. Anderton (Batley) asked whether in the investigations the retort was filled completely, or was there a free space for cracking the tar?

Mr. R. N. Webb (New Wortley, Leeds; President of the Manchester District Association of Gas Engineers) said the results of pressure working at Shipley had confirmed their experience at New Wortley, where they adopted that practice some years ago. In his opinion the maintenance of a pressure in the retort helped scurfing. Some of the horizontal retorts at New Wortley would go 80 to 100 days without scurfing. Others would go 300 to 350—a wide difference which they had not yet quite fathomed. He did not believe in scurfing too frequently.

The Author's Reply.

Mr. Derbyshire, replying to the discussion, observed that the coal level in the retort at Shipley which had, up to the present, been on the longest cycle had been maintaind 7½ in. from the top of the retort. There did not appear to be any information as to the conductivity of scurf, and if structure and its method of adhesion varied in different plants it was reasonable to assume that conductivities would vary. Mr. Derbyshire said he was pleased to note that Mr. Elliott had found an increase of tar cracking while on pressure working. Mr. Derbyshire expressed thanks to Mr. Webb for his observations, and was glad of his corroboration that by pressure working one did obtain a higher tar yield per ton of coal carbonized. This, he felt, was more evident when carbonizing larger sized coals such as Doubles, combined with pressure conditions. It would be interesting if one could have two plants, one working under vacuum and the other under a definite pressure, and ascertain the difference in scurf formation and thickness, which, in the speaker's opinion, did exist.

Hearty thanks were accorded Mr. Derbyshire for his Paper, on the motion of Mr. J. Hubbard (Leeds), seconded by Mr. V. J. J. Siddons (Barnsley).

On the motion of Mr. R. N. Webb, seconded by Mr. S. R. Bennett (York), thanks were accorded the Chairman and Directors of the Barnsley Gas Company, and Mr. L. W. Harrison (Engineer and Manager), for hospitality during the afternoon, and refreshment provided after the meeting.

Mr. Lancaster (Chairman of the Company) and Mr. Harrison responded.

Cannon Iron Foundries, Ltd.

Chairman's Speech at General Meeting

Speaking at the Second Ordinary General Meeting of Cannon Iron Foundries, Ltd., held on Dec. 31, 1936, the CHAIRMAN (Mr. G. A. Leitch, B.Sc.) said:

Before proceeding to comment on the financial results I would like to refer to the late Chairman of the Company, Sir Francis H. Pepper, whose sudden and unexpected death on Nov. 21 last deprived us of a wise counsellor and friend. As you know, Sir Francis had been Chairman of the Company since its incorporation in March, 1935, but his association with the business covered many years prior to that date, during which your present Directors, who were also Directors of the former Private Company, had the benefit of his valuable services in a legal and advisory capacity. He greatly endeared himself to all who were privileged to know him by his kindly personality and he will be remembered with an enduring appreciation.

The value of freehold buildings has increased by £6,513, new offices having been built to provide adequate accommodation for the staff and improved facilities for administration, and also to release the former offices for necessary works extension. Substantial amounts are being written off this asset so as to provide capital for improvements as they become necessary.

The net decrease of £2,579 in the value of plant, machinery, &c., arises from the fact that the provision for depreciation considerably exceeds the cost of additions to this asset during the year, and in this connection we consider that the balance-sheet valuation is on a conservative basis. The book values of other fixed assets remain practically unchanged.

Of the floating assets, cash at bankers and in hand shows a reduction of £15,746, but this is more than offset by increase in sundry debtors (£8,984) and stock-in-trade (£4,610) and by reduction in current liabilities (£18,750). You will observe, no doubt with considerable satisfaction, that the floating assets at £200,548 exceed the liabilities to trade creditors and for taxation by more than £160,000, and the liquid position is very strong. The market value of the investments in Government Stocks was in excess of the book value at the date of the balance-sheet.

Reference has already been made to the liabilities, but your attention is directed to the fact that the liability of £27,906 to the Liquidator of the former Company has been completely discharged during the year under review.

The profit on trading, £76,946, is £3,350 higher than for 1935, and the net profit for the year has increased by approximately the same amount. This satisfactory result is directly due to a considerable increase in the volume of our turnover, the sales for the year having exceeded all previous figures in the history of the business, notwithstanding that our price level remained unchanged in comparison with that of the previous year. The maximum benefit from the extra turnover was not obtained, by reason of the rising costs of raw materials—particularly pig iron and fuel—and of wage increases under the National Agreement. Fortunately, we were able to reduce to some extent the burden of such increases this year by carrying heavier stocks and enlarging our forward contracts, and while production costs will undoubtedly be higher during the ensuing year, increased selling prices have become effective during the last few weeks and will partially, but not wholly, restore the margin of gross profit. It may be noted that the price of all standard grades of foundry pig iron was raised by 6s. per ton about a month ago, and the total increase during the last 18 months amounted to 16s. per ton, or about 23%.

I am pleased to report that the demand for your Company's products continues to increase and steps are being taken to improve our productive capacity. The volume of orders on the books is very satisfactory, and the sales for the current year to date show an improvement on the record total obtained in the corresponding period of 1934.

The sum of £2,000 has again been provided for distribution by way of bonus to staff, and I venture to think this will receive your entire approval. Your Directors are very pleased to take this opportunity of acknowledging the splendid co-operation and capable assistance rendered throughout the year by all members of the staffs.

In the report of the Directors certain recommendations are made as to the distribution of the available profits which I shall very shortly ask you to approve. An interim dividend of 5%, less income-tax, was paid on the ordinary shares in July last, and with your approval it is proposed to pay a final dividend of 10%, less income-tax, making 15%, less income-tax, for the year.

With a view to further strengthening the Company's position we consider that £10,000 should be placed to general reserve and £4,000 to income-tax reserve, and that the balance of profits amounting to £10,959 3s. 9d. be carried forward.

With these few remarks I now have pleasure in moving

> That the Report of the Directors and the accounts for the year ended Sept. 30, 1936, annexed thereto be and the same are hereby received, approved, and adopted.

Mr. R. TALBOT CLAYTON seconded the resolution.

The report and accounts were unanimously adopted. The retiring Director, Mr. R. D. Barnet Clayton, was re-elected, and a vote of thanks to the Chairman concluded the proceedings.

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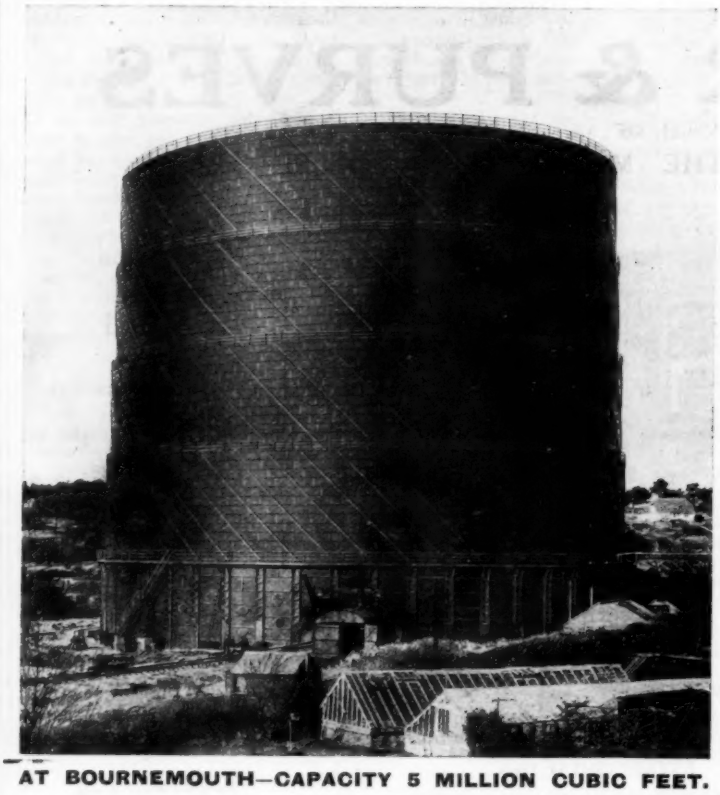

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

The Stock Exchange closed for the New Year's holiday on Thursday last in an optimistic mood and markets were active right up to the end. Despite the many international troubles the year 1936 has been one of remarkable progress at home, and this is reflected in the rise in prices of practically all classes of securities. Industrials have been stimulated by the many good reports, and the majority closed substantially higher on the year. The same is true also of home and foreign rails. In the more speculative groups, rubber and mining shares considerably appreciated, while leading oil shares reached higher prices than for some years past. The most important exception to the general trend is that of gilt-edged stocks which closed slightly lower. The outlook for 1937, therefore, is distinctly promising, and in the absence of further international complications the New Year should bring with it even greater activity.

The Gas Market also closed firm, and during the four days of business last week several stocks appreciated in value. In the London List, Gas Light units improved 3d. to 26s. 9d.; Montevideo went ahead again with a rise of 5 points to 82½; Lea Bridge gained 3 to 188½; and several smaller improvements were recorded. In the Supplementary List, Associated ordinary shares closed 6d. higher at 22s., but the nominal quotation of Guildford Consolidated was marked down 20 points to 205 and that of Yorktown 10 points to 142½. At the Provincial Exchanges, Newcastle units eased 3d. to 27s.

In conformity with the usual practice, the lowest and highest prices of recorded transactions during the past year (excluding those done at special bargain prices) have been inserted in the London Stock and Share List. Comparing these with the figures for 1935, it is satisfactory to note that, with few exceptions, the margins last year were considerably smaller, thus indicating a uniform steadiness throughout the period, and that in most cases the year closed with prices at about the highest. Among the exceptions are Alliance and Dublin ordinary with a range of 36 points and Montevideo with a margin of 31 points, both finishing the year at the highest price, while Imperial Continental with 59 points and South Metropolitan with 24 points closed very nearly at the lowest.

The Directors of the Gas Light and Coke Company have placed privately £993,000 3¾% redeemable preference stock, 1970, at a price of 100⅜%. It will be remembered that the Company issued £2,000,000 of similar stock in February last at par, and this is now changing hands at round about 103.

Current Sales of Gas Products

The London Market for Tar Products.

Jan. 4.

There is little of interest to record in the Tar Products Market, prices being at about the following levels:

Pitch, nominal, at 34s. per ton f.o.b.
Creosote, 5¾d.
Refined tar, 3¾d.
Pure toluole, 2s. 4d. to 2s. 5d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 7d.; and 90/160 pyridine, about 7s. 6d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Jan. 4.

The average prices of gas-works products during the week were: Gas-works tar, 18s. 3d. to 23s. 3d. Pitch—East Coast, 32s. to 34s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 32s. to 34s.* Toluole, naked, North, 1s. 11d. to 2s. Coal tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 1½d. to 1s. 2½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅞d. to 5⅛d.; low gravity, 4¼d. to 4¾d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 2s. 7d. to 2s. 8d. Naphthalene, £18 to £20. Salts, 90s. to 95s., bags included. Anthracene "A" quality, 4½d. to 4⅝d. per minimum 40% purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Jan.* 2.

Prices of most products continue steady, but actual trading is not likely to resume seriously until after the holidays.

Crude gas-works tar.—The actual value is 34s. to 35s. per ton *ex* works in bulk.

Pitch continues a dull feature, with quotations easy at 30s. to 32s. 6d. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is changing hands in small quantities at 3d. per gallon f.o.r. for export, and 3¾d. per gallon *ex* works in buyers' packages for home trade.

Creosote oil.—Supplies are well looked after and quotations are firm. Specification oil, 5d. to 5¼d. per gallon; low gravity, 5d. to 5¼d. per gallon; neutral oil, 4¾d. to 5d. per gallon; all *ex* works in bulk.

Cresylic acid.—There is a continued demand for available supplies, and prices are not lower than the following: Pale, 97/99%, 2s. 5d. to 2s. 7d. per gallon; dark, 97/99%, 2s. 2d. to 2s. 4d. per gallon; and pale, 99/100%, 2s. 9d. to 3s. per gallon; all *ex* works in buyers' packages.

Crude naphtha.—Available supplies continue to command 5½d. to 6d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha.—90/160 grade is easy at 1s. 4d. to 1s. 4½d. per gallon, while 90/190 heavy naphtha remains at 11d. to 1s. per gallon.

Motor benzole is available at 1s. 2½d. to 1s. 3d. per gallon.

Pyridines.—Prices are nominal at 6s. to 6s. 6d. per gallon for 90/160 grade, and 7s. to 7s. 6d. per gallon for 90/140 grade.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole . . .	0	8½	to	0	9	per gallon at works
Motor ,, . . .	1	2	,,	1	2½	,, ,, ,,
90% ,, . . .	1	3	,,	1	3½	,, ,, ,,
Pure ,, . . .	1	7	,,	1	7½	,, ,, ,,

Contracts Advertised To-Day

Asbestos Goods.
Salford Gas Department. [p. 58.]

Belting.
Salford Gas Department. [p. 58.]

Coal.
Salford Gas Department. [p. 58.]

Gasholders.
Ossett Gas Department. [p. 58.]
Redcar Gas Department. [p. 58.]

General Stores (Cocks, Tools, Castings, Lead, Yarn, Tinware, &c.).
Salford Gas Department. [p. 58.]

Lighting Goods (Mantles, Fittings, Globes, &c.).
Salford Gas Department. [p. 58.]

Meters.
Salford Gas Department. [p. 58.]

Pipes, &c., and Fittings.
Salford Gas Department. [p. 58.]

Refractory Materials.
Salford Gas Department. [p. 58.]

Station Meter.
Middlesbrough Corporation. [p. 58.]

Tank (Oil Storage).
Darlington Gas Department. [p. 58.]

Waste Heat Boiler.
Plymouth Corporation Gas Department. [p. 58.]

Weighing Machine Repairs.
Salford Gas Department. [p. 58.]

Diaries, Calendars, &c., Received

Seasonable gifts in the shape of useful diaries, calendars, &c., have been received from the undermentioned friends, whose good wishes are heartily reciprocated:

British Jeffrey-Diamond, Ltd.
Brotherton & Co., Ltd.
Chancery Lane Printing Works, Ltd.
Clay Cross Company, Ltd.
Clayton, Son, & Co., Ltd.
Dougall's Gas Meters, Ltd.
Gale & Polden, Ltd.
Harris & Pearson, Ltd.
R. & A. Main, Ltd.
Simon-Carves, Ltd.
Standard Furnace and Setting Company
Stanton Ironworks Company, Ltd.
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THE **JOHANNESBURG** MUNICIPAL GAS DEPT. (3RD ORDER)
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THE **WORCESTER** NEW GAS LIGHT CO. (2ND ORDER)
THE **YEADON AND GUISELEY** GAS CO. (2ND ORDER)
THE **CARLISLE** CORPORATION GAS DEPT. (2ND ORDER)
THE **DUMBARTON** CORPORATION GAS DEPT. (2ND ORDER)
THE **BELFAST** CORPORATION GAS DEPT. (6TH ORDER)
THE **DUDLEY,** BRIERLEY HILL & DISTRICT GAS CO. (4TH ORDER)
THE **GALASHIELS** GAS LIGHT COMPANY
THE **CHARD** CORPORATION GAS DEPARTMENT

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STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Dec. 31.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Year 1936. (a)
1,767,439	Stk.	Sept. 7	7⅞	8	Alliance & Dublin Ord. ...	169—174	+2	140—176
374,000	,,	Dec. 14	4	4	Do. 4 p.c. Deb. ...	92—97*	...	100⅞—101¼
557,655	,,	Aug. 10	7	7	Barnet Ord. 7 p.c.	168—173	...	167—172½
300,000	1	Oct. 5	1/9⅜	1/4⅜	Bombay, Ltd.	26/—28/-	...	26/—28/-
179,305	Stk.	Aug. 10	9½	9½	Bournemouth sliding scale ...	220—230	...	222—230
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	171—176	...	169—177
493,960	,,	,,	6	6	Do. 6 p.c. Pref. ...	148—153	...	149—155
50,000	,,	Dec. 14	3	3	Do. 3 p.c. Deb. ...	85—90*	...	87½—90
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	104—109*	...	106½—110
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	123—128*	...	124½—129½
357,900	,,	Aug. 10	7½	7½	Brighton, &c., 6 p.c. Con. ...	168—173	...	171—174½
649,955	,,	,,	6¾	6¾	Do. 5 p.c. Con. ...	154—159	...	155—159½
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	145—150	...	144—149
855,000	,,	Oct. 5	8	7	British Ord.	157—162	...	153½—163
100,000	,,	Dec. 14	7	7	Do. 7 p.c. Pref.	148—153*	...	153—156½
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	108—113*	...	114½
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100*	...	97—100
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—114*	...	111½—114½
200,000	,,	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	99—102*	...	98—100
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	25/—30/6
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	30/—40/-
150,000	Stk.	June 22	4½	4½	Do. 4½ p.c. Deb. ...	80—85	...	81—87
626,860	,,	July 20	6	6	Cardiff Con. Ord.	128—133	...	130½—132
237,860	,,	Dec. 14	5	5	Do. 5 p.c. Red. Deb.	108—113*	...	110—112
98,936	1	Oct. 19	2/-	2/-	Colombo Ord.	1⅞—1⅞	...	34/6—36/-
24,510	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	23/6—25/6	...	21/—23/9
609,204	1	Oct. 5	-/11/48	-/11/48	Colonial Gas Assn. Ltd. Ord.	17/6—19/6	...	18/6—21/-
296,053	1	,,	1/3/30	1/3/30	Do. 8 p.c. Pref.	21/—23/-	...	22/7½—24/6
1,775,005	Stk.	Aug. 10	5	5	Commercial Ord.	93—98	...	93—105
620,000	,,	Nov. 30	3	3	Do. 3 p.c. Deb. ...	83—88	...	85—88½
286,344	,,	Aug. 10	5	5	Do. 5 p.c. Deb. ...	122—127	...	122—125½
807,560	,,	Aug. 10	7	7	Croydon sliding scale ...	158—163	...	154—164
644,590	,,	,,	5	5	Do. max. div.	115—120	...	116—120
620,385	,,	Dec. 14	5	5	Do. 5 p.c. Deb.... ...	123—128*	...	123—128½
239,000	,,	Aug. 10	5	5	East Hull Ord. 5 p.c.... ...	108—111	...	105—110½
184,555	,,	Aug. 10	6	6	East Surrey Ord. 5 p.c. ...	128—133	...	...
176,211	,,	Dec. 14	5	5	Do. 5 p.c. Deb. ...	121—126*	...	122—127½
250,000	1	Nov. 16	4	4	Gas Consolidation Ord. ...	20/6—22/6	...	22/—22/4½
250,000	1	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	19 —21/-	...	19/9—20/3
19,284,128	Stk.	Aug. 10	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	26/3—27/3b	+/3	25/10½—28/6
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	89—92	...	88—92½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	104—108	...	104—110½
8,602,497	,,	Nov. 30	3	3	Do. 3 p.c. Con. Deb. ...	83—86	...	83½—93½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	116—120
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb....	114—117	...	114—118
700,000	,,	Sept. 7	...	25/5⅝	Do. 4½ p.c. Red. Deb....	102—104	...	102½—105
270,466	,,	Aug. 24	6	6	Harrogate New Cons. ...	128—133	...	130—133½
213,200	,,	Aug. 10	6	6	Hornsey Con. 3½ p.c. ...	133—138	...	134—142
5,600,000	,,	Nov. 2	12	8	Imperial Continental Cap. ...	145—150	...	130—139
223,130	,,	July 20	3½	3½	Do. 3½ p.c. Red. Debs....	92—97	...	93—97
285,242	,,	Aug. 24	8½	8½	Lea Bridge 5 p.c. Ord. ...	186—191	+3	175—190
11,751	,,	,,	10	8	Maidstone Gas 5 p.c. Cap. Stk.	190—200	...	187
63,480	,,	Dec. 14	3	3	Do. 3 p.c.Prp.Db.Sk.	79—84*	...	82—85
75,000	,,	Nov. 30	†10	†10	Malta & Mediterranean ...	185—195	...	195—205
392,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	100—105	...	104—106½
231,978	Stk.	Aug. 24	5	5	M.S. Utility 'C' Cons. ...	110—115	...	111½—114½
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	102—107	...	102—107
360,075	,,	Dec. 14	4	4	Do. 4 p.c. Deb. ...	103—108*	...	104—108
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	121—126*	...	123—127
125,000	—	July 1	3½	3½	Do. 3½ p.c. Rd.Rg.Bds.	97—100	...	...
675,000	Stk.	Nov. 16	†6	†6	Montevideo, Ltd.	80—85	+5	51—82
225,000	,,	Aug. 10	7½	7½	North Middlesex 6 p.c. Con.	170—175	...	170—176
396 160	,,	Aug. 10	5	5	Northampton 5 p.c. max. ...	110—115	...	110—113½
300,000	,,	Nov. 2	†7	†9	Oriental, Ltd....	168—173	...	167—172
416,617	,,	Dec. 14	8	8	Plymouth & Stonehouse 5 p.c.	165—170*	...	164—173
504,416	,,	Aug. 10	8½	8½	Portsmouth & Gosport Cons.	178—183	...	173—183
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	114—119	...	110—118
73,350	,,	,,	...	5	Do. 5 p.c. Pref. ...	118—123	...	119—120
363,470	1	Sept. 21	1/-	1/-	Severn Val. Gas Cor. Ld. Ord.	21/6—23/6	...	21/6—23/4½
454,510	1	,,	-/10½	-/10½	,, ,, 4½ p.c. Cum. Pref.	21/—23/-	...	21/6—22/9
133,201	Stk.	Aug. 24	5	8½	Shrewsbury 5 p.c. Ord. ...	145—150	...	144½—151
90.000	10	June 8	†3½	†4	South African...	4—5	...	77/6—97/6
1,152,635	1	Sept. 7	1/2⅝	1/2⅝	South East'n Gas. Cn.Ld. Ord.	27/—29/-	...	26/6—28/9
845,511	1	,,	-/10⅜	-/10⅜	Do. 4½ p.c. Red. Cum. Pref.	21/—23/-	...	21/3—23/3
200.000	1	,,	4	4	Do. 4 p.c. Cum. Pref. ...	20/6—21/6	...	21/—21/6
150,000	Stk.	Aug. 10	...	3½	Do. 3½ p.c. Red. Deb. ...	100—102	...	101¼
6,709,895	,,	Aug. 10	6¾	5	South Met. Ord.	114—117	+1	112—136
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf. ...	145—150	...	143½—152
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf. ...	104—107	...	104½—107⅞
1,895,445	,,	Dec. 14	3	3	Do. 3 p.c. Deb. ...	83—86*	...	83—91
1,000,000	,,	July 6	5	5	Do. 5 p.c. Red. Deb....	114—117	...	114—117
1,543,795	,,	Aug. 10	6	6	South Suburban Ord. 5 p.c....	130—135	...	130—136
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	121—126	...	123—126½
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	102—107	...	104½—107½
888,587	,,	Dec. 14	5	5	Do. 5 p.c. Deb....	122—127*	...	123—128
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	103—108*	+2	105½—108½
427,859	1	Nov. 16	1/2⅜	9⅜	S. Western Gas & Water Ord.	21/—23/-	...	21/3—23 9
160.523	1	Oct. 19	-/10⅜	-/10⅜	Do. 4½% Red. Cum. Pref.	20/6—22/6	...	22/—22/10½
110.000	Stk.	Dec. 14	4	4	Do. 4% Red. Deb. ...	100—105*	...	103½—105
647,740	,,	Aug. 10	5½	5	Southampton Ord. 5 p.c. ...	113—118	+1	114—118½
121,275	,,	June 8	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	,,	Aug. 10	5½	5½	Swansea 5½ p.c. Red. Pref. ...	112—117	...	113—117½
106.000	,,	June 8	6½	6½	Do. 6½ p.c. Red. Deb. ...	98—101	...	100
94,000	,,	,,	§35/-	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	98—100½
1,076,490	,,	Aug. 10	6⅝	6⅝	Tottenham and District Ord.	152—157	...	150½—156
409,835	,,	,,	5½	5½	Do. 5½ p.c. Pref....	130—135	...	130—134½
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	121—125
371,850	,,	Nov. 30	4	4	Do. 4 p.c. Deb. ...	102—107	...	105—108
369,774	,,	Aug. 10	7	7	Uxbridge, &c., 5 p.c. ...	165—170	...	150—165
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	122—126½
1,340,521	,,	Aug. 10	7	7	Wandsworth Consolidated ...	159—164	...	158—164
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	123—126⅝
500,000	,,	,,	...	...	Do. 4 p.c. Pref. ...	104½—107½	...	105—107½
1,317,964	,,	Dec. 14	5	5	Do. 5 p.c. Deb. ...	125—130*	...	124½—131⅝
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	102—107*	...	105—106
499,735	,,	Aug. 10	7¼	7	Watford and St. Albans Ord.	157—162	...	153½—161
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	121—125
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	131—136	...	133—136½
200.000	,,	Dec. 14	4	4	Do. 4 p.c. Red. Deb.	100—105*	...	98½—101⅞
100,000	,,	,,	3½	3½	Do. 3½ p.c. Red.Deb.	99—102*	...	101⅛—102½
158,400	,,	Aug. 24	6c	5⅞	Winchester W.& G. 5 p.c. Con.	120—125	...	125½—126

a.—Excluding special bargains of back dividends. *b.*—The quotation is per £1 of Stock. * Ex div. † Paid free of income-tax. *c.*—Paid £3, including 10s. on account ‡ For year. § Actual.

Stock and Share List continued overleaf.

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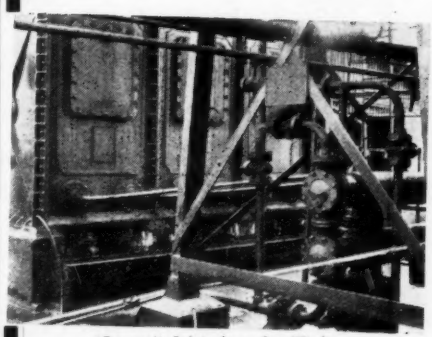
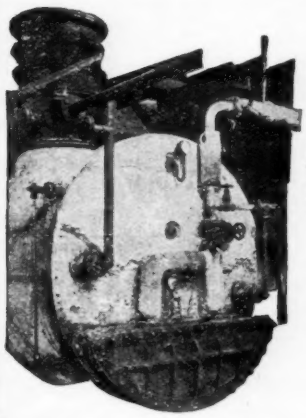


"Permac" Joints in a Gas Works.



"Permac" Joints on a Benzol Rectification Still.

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STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Dec. 31.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	July 20	6	5	Bath Cons.	125—127	...	...
1,667,250	,,	July 6	5	5	Bristol, 5 p.c. max.	118—120	...	...
120,420	,,	Dec. 14	4	4	Do. 1st 4 p.c. Deb. ...	101½—103½*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	101½—103½*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	122—125*	...	...
274,000	,,	Aug. 10	5	5	Newport (Mon.) 5 p.c.max. ...	110—114	...	...
13,200	12	Sept. 7	8½	7	Pontyp'l Gas & W. 10 p.c. 'A'	13½—14½	...	...
13,600	10	,,	6	5	Do. 7 p.c. 'B'	12—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C'	12—12½	...	...
140,778	Stk.	Aug. 10	5	5	Weston-super-Mare Cons. ...	112—114	...	...
64,338	,,	Dec. 14	4	4	Do. 4 p.c. Deb.	98—101*	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	160—163*	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Aug. 10	6½	5	Chester 5 p.c. Ord.	107—112	...	...
92,500	,,	Dec. 14	4½	4	Do. 4 p.c. Pref.	98—102*	...	...
32,540	,,	,,	3	3½	Do. 3½ p.c. Deb.... ...	90—95*	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	99—103*	...	...
2,167,410	,,	Aug. 24	6	6	Liverpool 5 p.c. Ord. ...	131—133	−1	...
245,500	,,	Dec. 14	5	5	Do. 5 p.c. Red. Pref. ...	101—106*	...	...
306,083	,,	July 6	4	4	Do. 4 p.c. Deb. ...	104—106	...	...
106,280	,,	July 20	10	10	Preston 'A' 10 p.c.	198—208	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	137—147	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Aug. 10	8	8	Blyth 5 p.c. Ord.	164—166	...	...
732,000	,,	Aug. 10	5	5	Hartlepool G. & W. Cn. & New	125—127	...	...
2,061,315	,,	Aug. 10	5⅔	5	Newcastle & Gateshead Con.	26/9—27/3*a*	−/3	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	104—105	...	...
776,706	,,	June 22	3½	3½	Do. 3½ p.c. Deb. ...	100—102	...	...
277,285	,,	Nov. 2	5	5	Do. 5 p.c. Deb. '43...	108—109	...	...
209,820	,,	Aug. 10	8½	8½	South Shields Con.	172—174	...	...
299,542	,,	Aug. 10	6	6	Sunderland 6 p.c. max. ...	140—142	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Aug. 10	10	7	Derby Con.	185—195	...	...
55,000	,,	Dec. 14	4	4	Do. 4 p.c. Deb.	100—105*	...	...
84,750	,,	Feb. 17	5	12	Long Eaton 'A' Ord. ...	...	...	...
50,000	,,	,,	4	10	Do. 'B' Ord. ...	...	...	...
20,000	10	Dec. 14	5	5	Do. 5 p.c. Pref. ...	10—12*	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122*	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 10	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,806,339	,,	Aug. 24	6	6	Sheffield Cons.	146—148	...	...
95,000	,,	July 6	4	4	Do. 4 p.c. Deb.	102—105	...	...

a The quotation is per £1 of Stock.

Supplementary List of Stocks and Shares not Officially Quoted

202,152	Stk.	Nov. 2	5	25/-*a*	Ascot Ord.	118—123	...	...
128,182	,,	July 6	...	5	Do. 5 p.c. Pref.	115—120	...	...
312,083	1	Nov. 16	5	5	Assd. Gas and Water Ord. ...	21/—23/-	+-/6	...
326,071	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	21/—23/-	...	...
150,000	Stk.	Sept. 21	...	3½	Do. 3½ p.c. Red. Deb. ...	98—101	...	...
17,000	,,	Aug. 24	8	8	Bognor Orig. Ord. 'A' ...	175—185	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	175—185	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	145—150	...	...
37,440	,,	Aug. 10	10	10	Cam. Univ. & Town 10 p.c.max.	205—215	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	155—160	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	108—113	...	...
65,000	,,	Aug. 10	8½	7½	Eastbourne 'A' 5 p.c. ...	175—180	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	142—147	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	...
130,000	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	122—127*	...	...
24,000	30	Aug. 10	8½	8½	Great Yarmouth 8½ p.c. max.	51—56	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.	42—45	...	...
51,160	Stk.	Dec. 14	5½	5½	Do. 5½ p.c. Deb.... ...	123—128*	...	...
152,600	,,	Sept. 7	8	8	Guildford Cons.	200—210	—20	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	114—119	...	...
68,250	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	120—125*	...	...
156,600	,,	Aug. 24	7½	7½	Hampton Court Cons. ...	173—178	...	...
107,960	10	Oct. 5	5½	4	Mid Kent Ord.	10—11	...	...
230,940	Stk.	Aug. 10	10	10	Oxford & District Ord. ...	215—225	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	113—118	...	...
126,193	,,	Nov. 16	7½	7½	Peterborough Ord.	162—172*	...	...
64,990	,,	Sept. 7	6½	7½	Redditch Ord.	133—143	...	...
166,850	,,	Aug. 10	9	8	Romford Ord.	168—178	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	101½
44,000	,,	Sept. 21	5	5	Do. 5 p.c. Deb.	120—125	...	...
10,950	,,	Aug. 24	8	8	Ryde Ord.	165—170	...	...
136,191	,,	Aug. 10	7	5	Scarborough Ord.	126—136	...	...
27,825	,,	Aug. 24	8	8	Shanklin & Ventnor Cons. ...	180—190	...	...
40,643	,,	Sept. 21	7	7	Slough Ord.	156—161	...	...
221,000	,,	Dec. 14	5	5	Do. 5 p.c. Deb.... ...	116—121*	...	...
28,872	1	Nov. 2	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	22/—24/-	...	...
28,866	1	Sept. 7	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	22/—24/-	...	...
137,730	Stk.	Aug. 10	7	7	Southgate & Dist. 7 p.c. max.	151—156	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	...
117,228	,,	Aug. 10	6	5	Swindon Cons.	110—115	...	...
60,425	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	115—120*	−3	...
64,380	,,	Dec. 14	5	5	Torquay and Paignton 5 p.c. Pf.	115—120*	...	...
750,000	1	Oct. 5	5·52d.*a*	4	Utd. Kingdom Gas Cpn. Ord.	21/6—22/6	...	21/9—22/-
606,270	1	,,	2½	2½	Do. 4½ p.c. Prefd. Ord. ...	20/—22/-	...	20/6
936,338	1	Nov. 16	4½	4½	Do. 4½ p.c. Cum. Pref. ...	21/6—23/6	...	22/9
600,000	Stk.	Sept. 21	3½	3½	Do. 3½ p.c. Red. Deb. ...	99—102	...	101
130,000	,,	Aug. 10	8	5	Wakefield Ord.	140—145	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	105—110	...	...
82,000	,,	July 20	6	6	Weymouth Ord.	105—110	...	...
98,384	,,	Aug. 10	6	6	Wolverhampton 6 p.c. Pref....	127—132	...	...
160,000	,,	Dec. 14	5½	5½	Do. 5½ p.c. Rd. Db	110—115*	+5	113—114
370,000	,,	July 20	6	4	York Cons.	110—120	−5	...
90,000	,,	Dec. 14	5	5	Do. 5 p.c. Red. Deb. ...	108—113*	...	...
133,640	,,	July 20	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	140—150	−10	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	123—128	...	...
35,000	,,	Dec. 14	5½	5½	Do. 5½ p.c. Deb.... ...	128—133*	...	...

a Actual.

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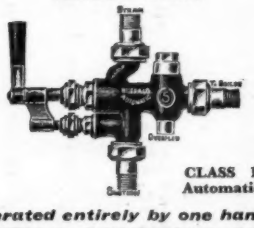
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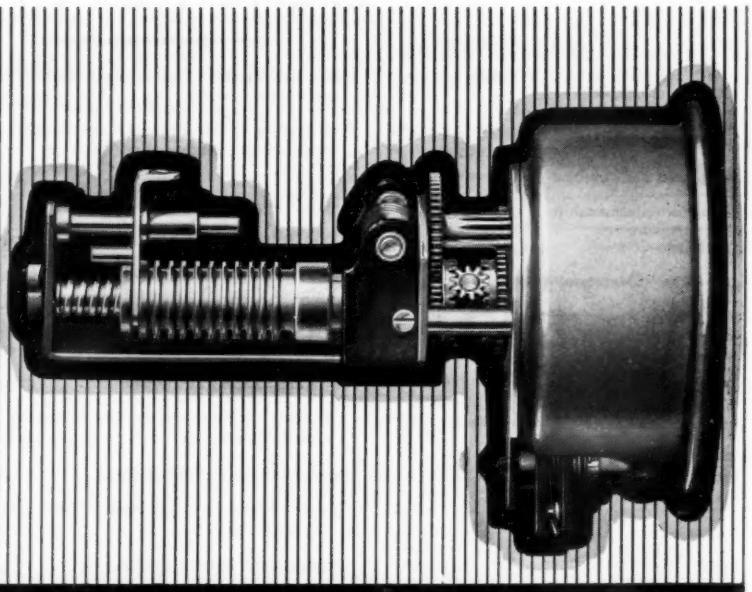

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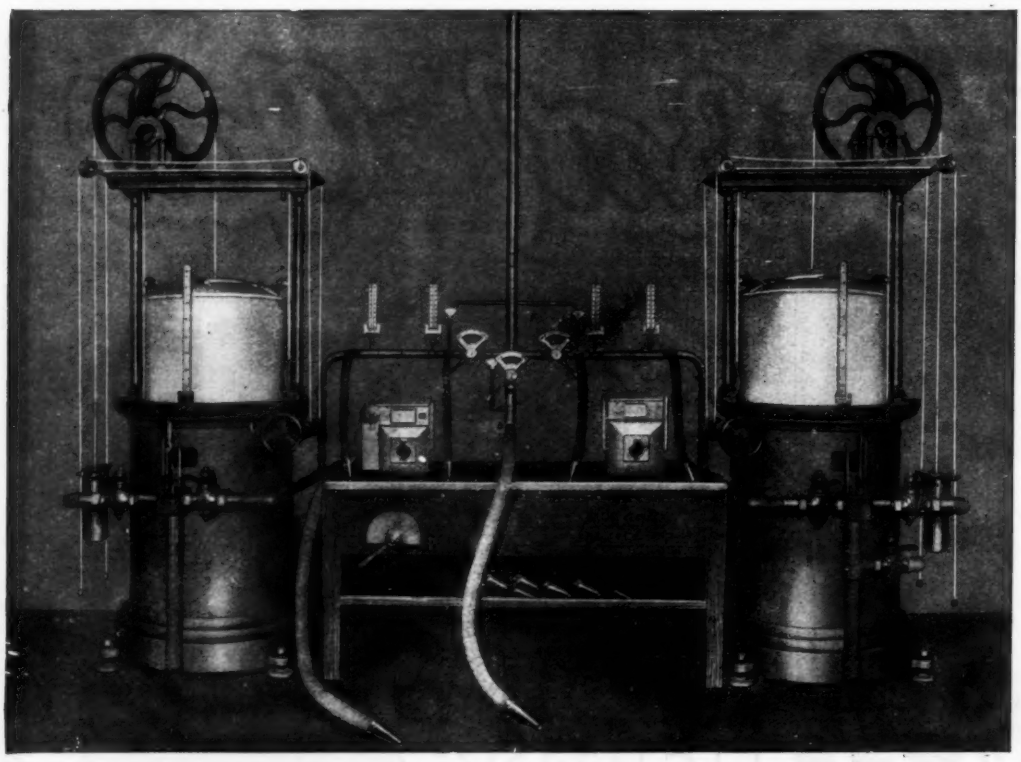

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